THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCIII. No. 2236.] LONDON, MARCH 20, 1906. [58TH YEAR. PRICE 6d.

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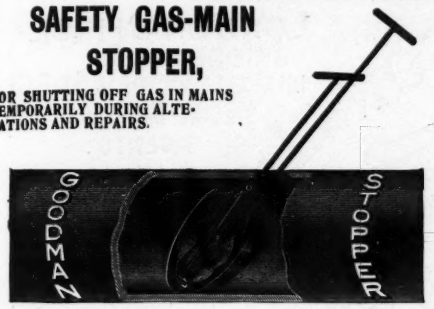

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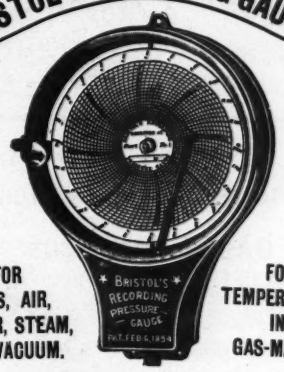

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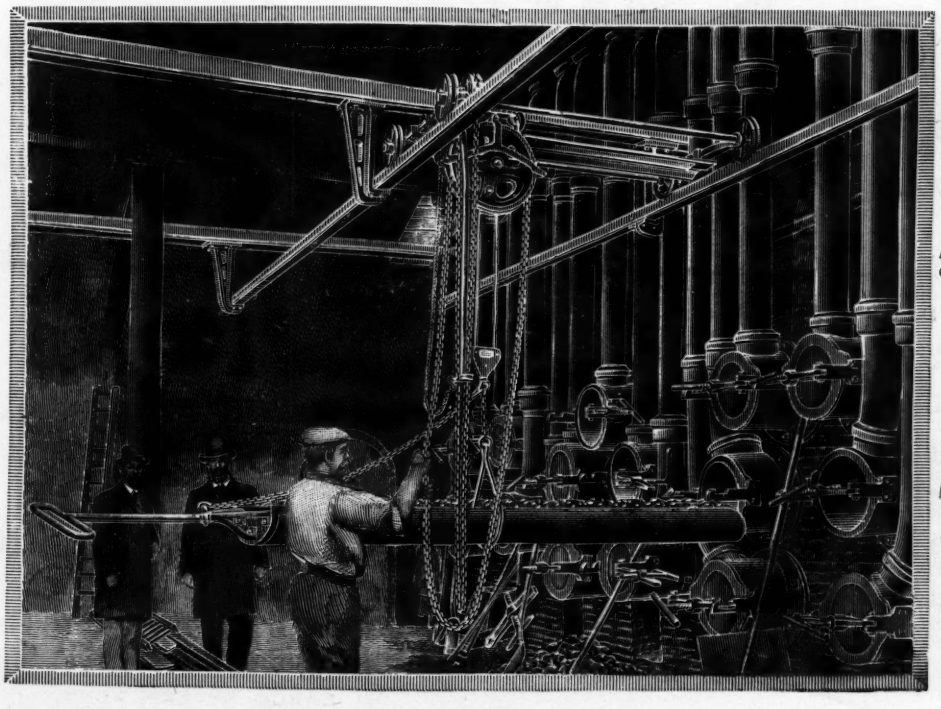

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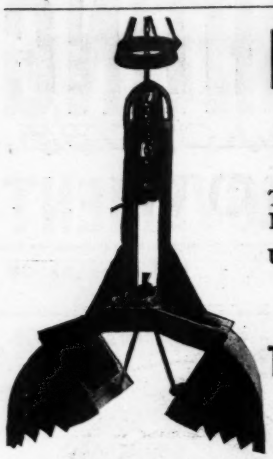

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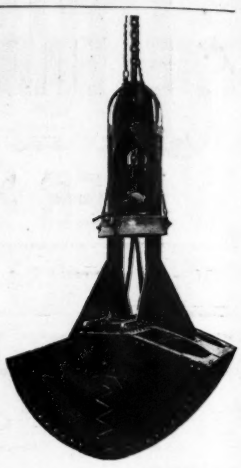

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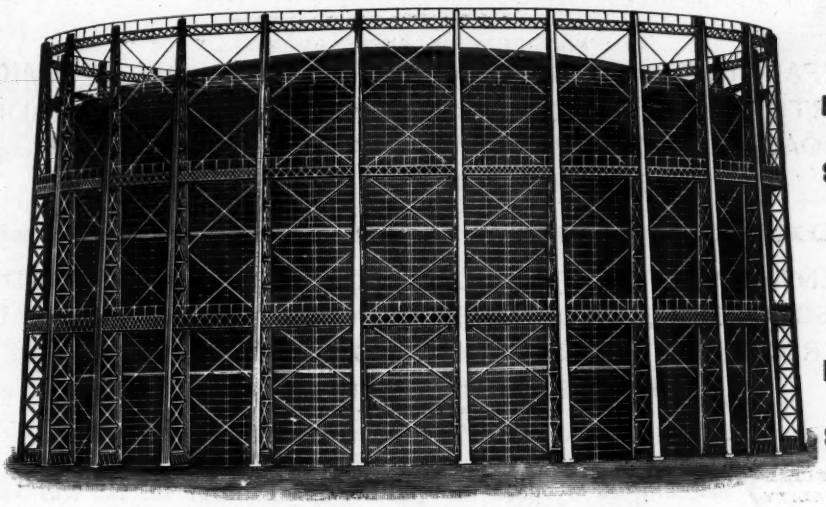

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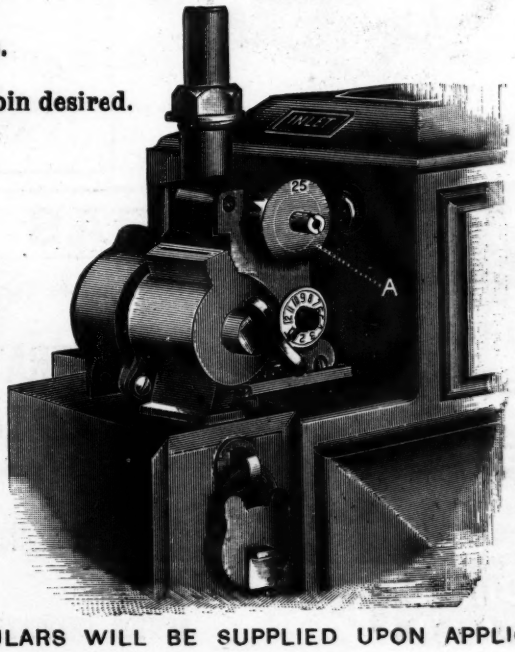

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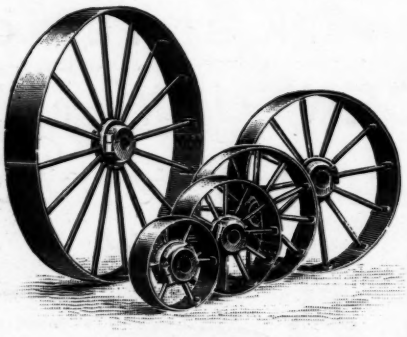

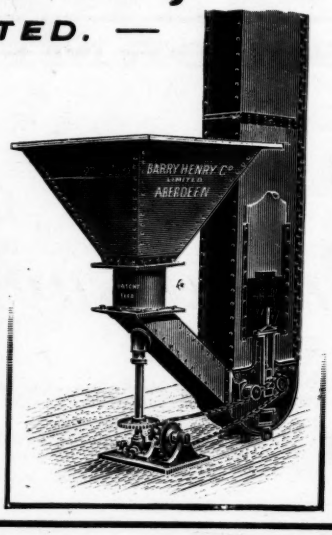

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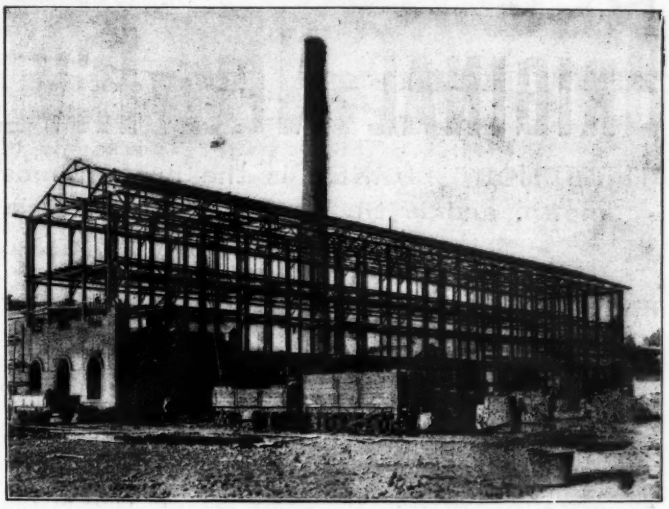

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WITH NOTES ON THE

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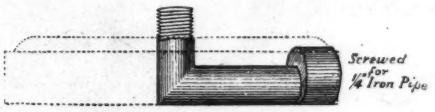

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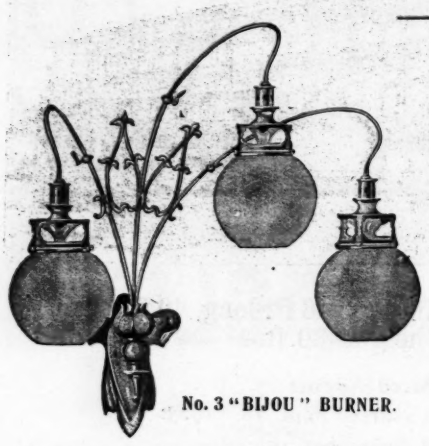

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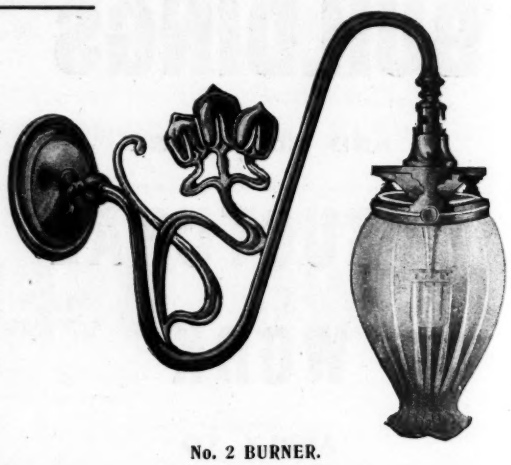

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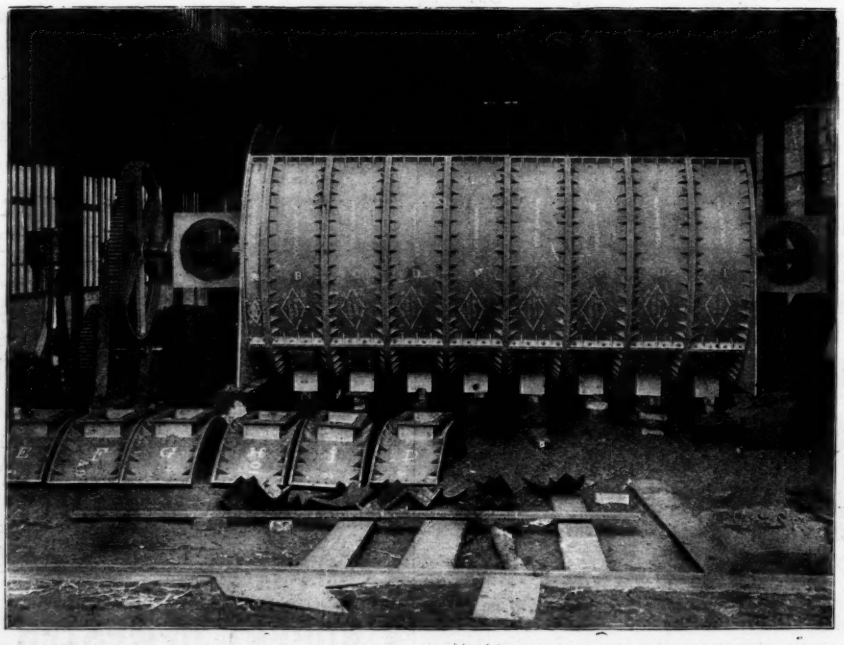

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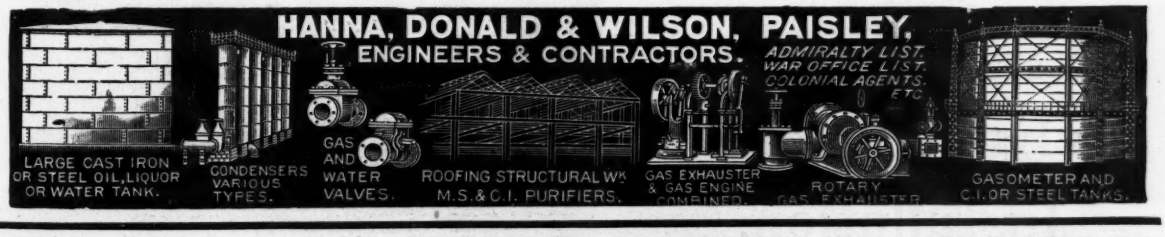
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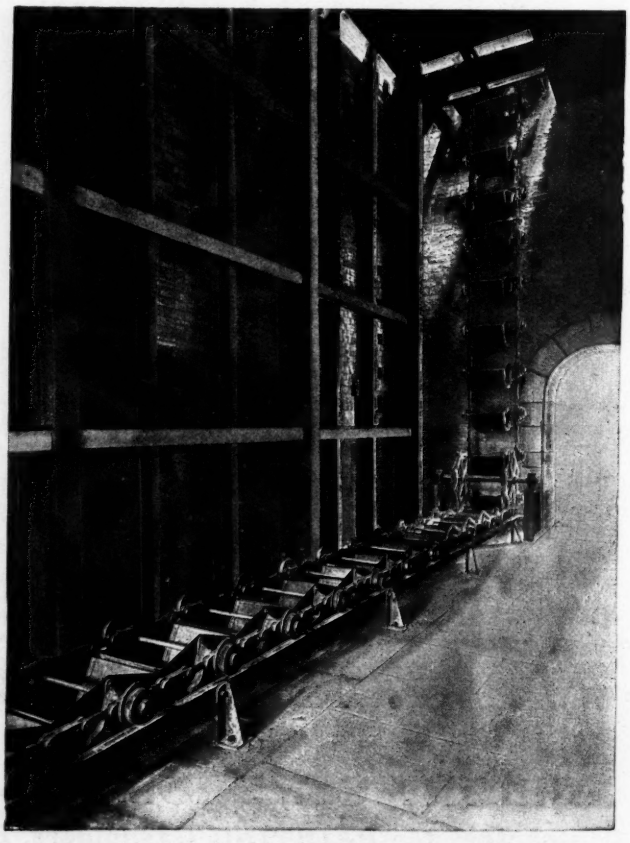

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But it's just as bad
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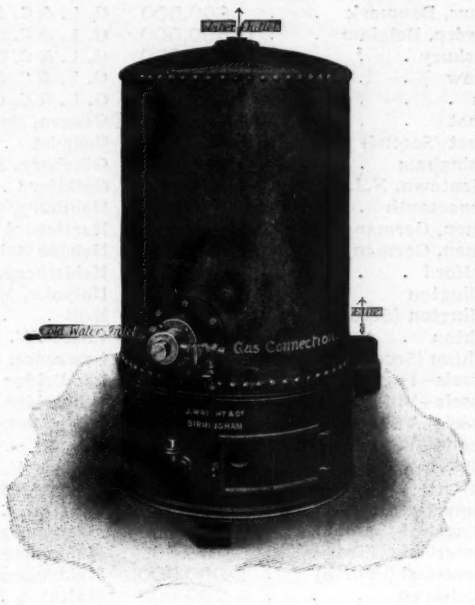
With **Wright's**
Automatic High-Pressure **Boiler**

Hot Water is always available.



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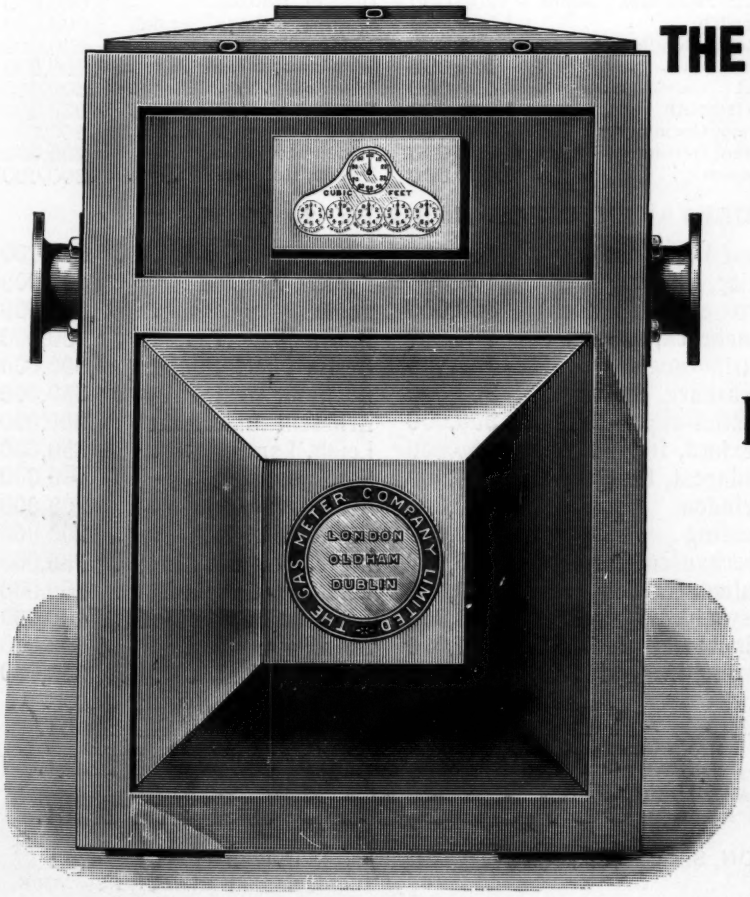

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ALL SIZES IN STOCK.

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Aylesbury	150,000	G. L. & C. Co., Bromley	3,750,000	Reichenberg, Bohemia	200,000
Barrow	300,000	G. L. & C. Co., Fulham	1,750,000	Romford	300,000
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Belfast	1,700,000	Geneva, Switz.	500,000	Rotterdam, Holland (Second)	1,500,000
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Bournemouth	1,000,000	Hamburg, Germany	1,750,000	Santiago de Cuba	400,000
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Brentford	1,200,000	Heidelberg, Germany	200,000	Shanghai (Second)	225,000
Bridlington	150,000	Holyoke, Mass.	600,000	Southampton	800,000
Bridlington (Second)	200,000	Hull	1,500,000	Southampton (Second)	500,000
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Brighton (Second)	1,850,000	Lawrence, Mass.	400,000	Southport	750,000
Brussels—Forest	1,000,000	Lea Bridge	350,000	Southport (Second)	900,000
Brussels—Ville	750,000	Lea Bridge (Second)	350,000	Stafford	500,000
Brussels—Ville (Second)	750,000	Liége, Belgium	1,000,000	Staines	600,000
Brussels—Ville (Third)	1,500,000	Lincoln	500,000	Stockport	600,000
Carlisle	600,000	Liverpool	3,500,000	Stockport (Second)	600,000
Chorley	300,000	Liverpool (Second)	4,500,000	Stockton-on-Tees	500,000
Commercial Gas Co.	850,000	Longton	600,000	Swansea	750,000
Commercial (Second)	850,000	Magdeburg, Germany	1,400,000	Swansea (Second)	1,000,000
Commercial (Third)	1,250,000	Maidenhead	225,000	Sydney—Harbour	500,000
Commercial (Fourth)	2,000,000	Maidenhead (Second)	225,000	Sydney—Harbour (Second)	500,000
Copenhagen	700,000	Malta	400,000	Sydney—Mortlake	500,000
Copenhagen (Second)	2,500,000	Manchester	3,500,000	Sydney—Mortlake (Second)	500,000
Coventry	600,000	Manchester (Second)	3,500,000	Syracuse, N.Y.	850,000
Coventry (Second)	600,000	McKeesport, Pa.	500,000	Taunton	225,000
Croydon	1,250,000	Merthyr Tydfil	300,000	The Hague, Holland	1,000,000
Croydon (Second)	625,000	Middlesbrough	1,250,000	Tilburg, Holland	400,000
Croydon (Third)	625,000	Newburgh, N.Y.	350,000	Tottenham	750,000
Deventer, Holland	150,000	Newburgh (Second)	250,000	Tottenham (Second)	750,000
Deventer, Holland (Second)	200,000	New York	1,200,000	Tottenham (Third)	350,000
Dorking	150,000	New York	4,000,000	Tottenham (Fourth)	1,000,000
Dublin	2,000,000	North Middlesex	150,000	Tunbridge Wells	1,000,000
Dublin (Second)	2,000,000	North Middlesex (Second)	200,000	Utrecht, Holland	1,000,000
Dunedin, N.Z.	150,000	Norwich	1,000,000	Utrecht, Holland (Second)	1,000,000
Dunedin, N.Z. (Second)	275,000	Ostend, Belgium	100,000	Waltham	400,000
Durham	200,000	Perth, W.A.	125,000	Wandsworth & Putney	1,800,000
Eastbourne	1,250,000	Port Elizabeth, S.A.	400,000	Watford	300,000
Edinburgh	2,000,000	Portsmouth	1,000,000	Watford (Second)	350,000
Epsom	225,000	Posen, Germany	450,000	West Ham	1,500,000
Falmouth	150,000	Posen, Germany (Second)	700,000	Winchester	225,000
Faversham	200,000	Preston	1,400,000	Zwolle, Holland	200,000

AND WORK UNDERTAKEN SINCE JANUARY 1, 1904.

Taunton (2nd)	350,000	West Ham (2nd)	800,000	Alkmaar, Holland	400,000
Bognor	100,000	Brieg, Silesia	100,000	Leiden, Holland	500,000
Bournemouth (2nd)	500,000	Brussels—Ville (4th)	350,000	Poole	1,500,000
Vienna	3,500,000	Innsbruck, Austria	200,000	Berlin-Rixdorf	650,000
Maastricht, Holland	200,000	Marlborough	100,000	Berlin-Charlottenburg	2,500,000
Antwerp, Belgium (2nd)	1,000,000	Flensburg, Sleswig	300,000	Bochum, Westphalia	530,000
Tottenham (5th)	1,000,000	Weston-super-Mare	300,000	Brussels–Anderlecht	350,000
The Hague, Holland (2nd)	500,000	Wexford, Ireland	100,000	Leigh, Lancs.	350,000
Hampton Court	500,000	Budapest, Hungary	50,000	Stockport (3rd)	400,000
Lea Bridge (3rd)	400,000	Swindon	300,000	Agram, Croatia.	200,000
Dublin (3rd)	650,000	Reading	1,000,000	Bruges, Belgium	200,000
North Middlesex (3rd)	75,000	Oberhausen, Germany	175,000	Liége, Belgium (2nd)	750,000
St. Gallen, Switz. (2nd)	225,000	Malmo, Sweden	350,000	Lemberg, Galicia	260,000
Brussels—St. Josse	1,000,000	Ipswich	750,000	Leeuwarden, Holland	400,000
Dundee	1,500,000	Winchester (2nd)	125,000	Stockholm	1,500,000
Bridgwater	200,000	Zwolle, Holland (2nd)	200,000	Romford (2nd)	350,000

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CONTENTS.

EDITORIAL NOTES.

GAS, &c.—
In Parliament—Draft Testing Clauses . . 781
The Progress of the Gas Industry . . . 782
Bye-Products from Electricity Generation. 782
Formation of an Illuminating Engineering Society 783
The Power and Heating Gas Question at Burton—Gas Consumer and Ratepayer—Cheaper Gas for Sheffield—Relieving the Rates—How to Make Electricity Pay . 783

Notes from Westminster 784
Gas Stock and Share Market 786
Electric Lighting Memoranda 786
An International Exhibition in Dublin to be Held Next Year. 787
Presentation to Mr. Henry Peaty 788
The Water Question at Devonport 788
Woodall-Duckham Vertical Retorts . . . 789
Notes on Purification. By W. Hill, of Stalybridge 790
Some Notes on Acetylene. By F. H. Leeds, F.I.C. 791
Midland Junior Gas Engineering Association 792
Air Gas. By F. R. E. Branston 793
An Interesting Coal-Storage Plant 794
The Specific Heat of Gases. By Dr. H. B. Harrop, of Milwaukee 796
Yorkshire Junior Gas Association 798
Scottish Junior Gas Association - Eastern District—
Mr. H. O'Connor on Gas for Heating . . 800
Mr. R. Webster on Gas as a Motive Power 801
Labour-Saving Appliances in Gas-Works. . 803
Prevention of Smoky Fogs 804

CORRESPONDENCE.

Purification Results at Chester and Stretford 806
Notes on Gas-Fires from an Official's Standpoint 806
Purification Results 807
Mr. Surman and his Retirement 807
Scottish Junior Association: Eastern Division—The Recent Visit to Dundee 807

REGISTER OF PATENTS.

Inverted Incandescence Gas-Lamps—Imray, O. (Julius Pintsch) 804
Measuring High Temperatures—Spooner, A. F. (C. Fèry) 804
Self-Lighting Gas-Burner—Theuerkorn, O. P. 805
Incandescent Gas-Lamps—Collett, A. E. . 805
Air and Gas Passages of Regenerative Furnaces and Tiles for Use therein—Brown, J.H. 805
Gas-Stoves—Woodall, H. W., and Duckham, A. M'D. 806
Vertical Gas-Retorts—Woodall, H. W., and Duckham, A. M'D.. 806
Patent Notices 821

PARLIAMENTARY INTELLIGENCE.

House of Lords—Great Yarmouth Water-Works and Lowestoft Water and Gas Bill; Progress of Bills. 808
House of Commons—Progress of Bills . . 808
House of Commons Committee—
Epsom and Ewell Gas Bill 808
Cardiff Gas Bill 809
Merthyr Tydfil Gas Bill 809
Unopposed Bills—Kidderminster Gas Bill; New Draft Testing Clauses for Gas Bills; Mirfield Gas Bill 809

MISCELLANEOUS NEWS.

Sheffield United Gas Company. 810
Provincial Gas Companies 810
Price of Gas for Power and Heating at Burton-on-Trent 811
Leicester Gas, Electricity, and Water Supply 812
Tottenham Council and the Gas Company—Opposition to the Bill Abandoned . . . 812
Hull Corporation and the Sulphur Question. 812
Street Lighting at Exeter—Municipal Electricity Undertaking and the Gas Company 812
The Supply of Electrical Fittings 813
Economics in Municipal Expenditure. . . 813
Metropolitan Water Board 813
The Protection of Welsh Water Areas . . 813
Afforestation of Watershed Areas 814
Notes from Scotland 814
Current Sales of Gas Products 815

MISCELLANEOUS NEWS (*continued*)—

Stock and Share List 815
Coal Trade Reports 816
"Electrical Explosion" at Leystone . . . 816
Gas Charges and Profits at Blackpool. . . 816
An Answer to a Recent Report on Gas-Lighted Trains. 817
Gas Companies as Gas-Fitters 817
Improperly Laying a Pipe to Convey Gas . 817
Camberwell Borough Council and the South Suburban Gas Bill 817

PARAGRAPHS.

German Rules for the Erection of Gas-Fires—The Manchester and District Junior Gas Association 785
Informal Meeting of Scottish Gas Managers. 787
Personal 788
Midland Junior Gas Engineering Association 788
Professor Lewes on Fire, Fire Risks, and Fire Extinction 789
Obituary 792
Production of Carbons for Arc Lamps . . 798
London and the South Wales Water Bill . . 807
Electric Power Supply for London 809
Monte Video Water-Works Company, Limited 811
Artesian Wells in London—Sulphuretted Hydrogen in London Gas. 815
Fire Risks of Electric Wires 816
Wages of Birmingham Gas-Works Labourers—Llandrindod Wells Gas Bill—Cartagena Water Supply—Production of Sulphate of Ammonia in Germany in 1905—Wandsworth Borough Council and the Sulphur Question—Failure of the Electric Light at Rhyl . 818
Lighting Contract at Midsomer Norton—Compensation for the Devonport Explosion—Water Scheme for Alfreton—New Water-Works for Milton—New Filter-Beds for Accrington—Borrowing Powers for Electric Lighting Refused—Bognor Water Company 819
Suffocation by Gas at Birkenhead—The Reduction in Price at Manchester—Price of Gas at Bitterne—Free Gas-Cookers at Oldham—Price of Gas to Manufacturers at Bolton—Lecture on Coal-Tar Products . 820
Cheaper and Better Gas at Ebbw Vale—Ilford Gas Company 821

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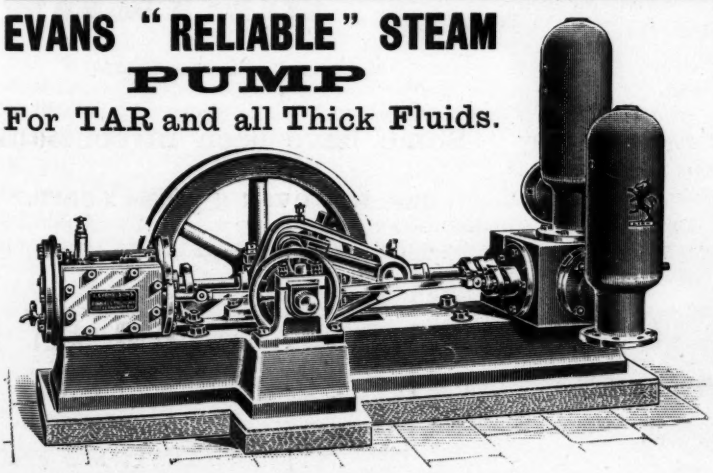

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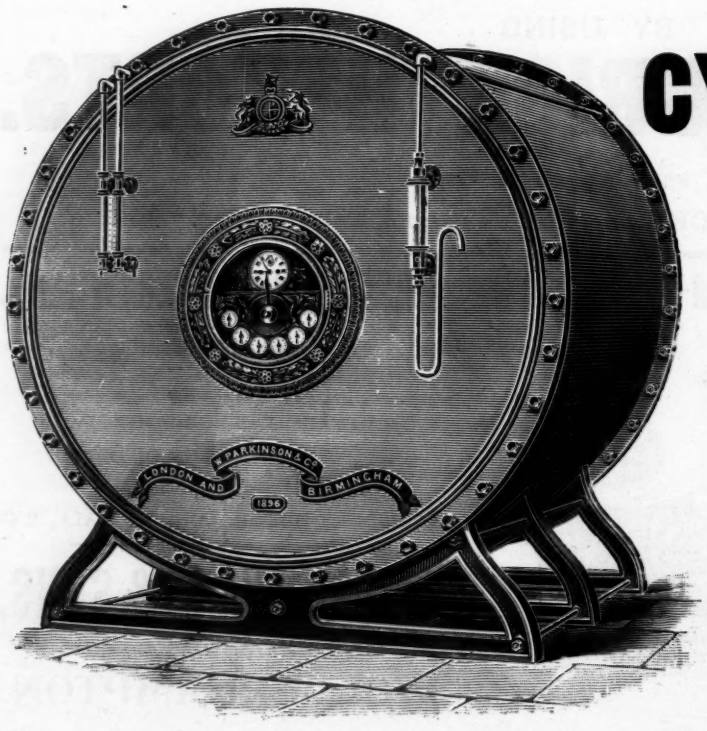

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EDITORIAL NOTES—GAS, &c.

In Parliament—Draft Testing Clauses.

ACTIVITY in pushing forward the Private Bill work is not a characteristic of the opening session of the new Parliament. Last week there were only three Committees sitting—one a Lords Committee, who were deeply engrossed in railway measures; one a Commons Committee, who had in their list at the start eight Gas Bills; and the Police and Sanitary Committee, who have a pretty considerable group of Local Authority measures under consideration—and up to the close of the week the only additional Committee appointed who will have certain Bills before them in which readers of the "JOURNAL" are concerned, but which are not of exceptional importance in respect of their proposals, was one in the Lords. It was not from a Select Committee that the surprise of the week emanated, but it was on the consideration of the unopposed Bill of the Kidderminster Gas Company, by the Chairman of Committees of the House of Lords (Lord Onslow), when it transpired that a set of draft clauses dealing with the testing of gas has been evolved, apparently with the view of getting something like uniformity in testing, now that a settlement satisfactory to all parties has been arrived at in connection with the Metropolitan Gas Supply. It does not, however, yet appear that these clauses will be made compulsory unless they fit the circumstances of the promoting gas company or local authority; but there is no doubt that, like the prepayment meter clauses, they will be pressed where they will appropriately apply. The proposed clauses are given *in extenso* in our "Parliamentary Intelligence." The principal section is the second, referring to the testing of gas for illuminating power; and its second clause is all-important, inasmuch as it defines that "the burner and other apparatus to be used "for testing the gas, and the method and rules to be observed "in the testing, shall be such as are, for the time being, "prescribed for testing the illuminating power of gas under "the provisions of the London Gas Act, 1905, in cases "where the illuminating power required is the same as that "required by this Act."

In previous comments on the Bills of the present session, we have animadverted upon the variability of the methods of testing proposed for what is now the very common standard of 14-candle illuminating power; but this continued variability was ascribed to the fact that, at the time most of the Bills were in process of preparation, the prescription of the Metropolitan Gas Referees for testing the 14 and 16 candle power gas in London had not been made public. But it was also suggested that the Bills in their final form would show a greater uniformity in this regard than in their initial stage. The prediction appears thus early to be in a fair way of fulfilment in consequence of these draft clauses. As the London Gas Act legislates for both 14 and 16 candle gas, it may be taken that, in the case of Bills proposing anything from 14 candles up to 16 candles, the clauses will be considered applicable. This, however, will not involve any hardship, seeing that, in most cases, the Bills specifying a particular burner also contain the condition (which secures, if possible, the realization of something better than the prescribed burner) "or such other burner as may be approved by the Board of "Trade." There is one remark to make on the clauses. The provision quoted above cites not only that the burner shall be such as is for the time being prescribed under the provisions of the London Gas Act, but that the "other apparatus" and the "methods and rules" shall apply. The "other apparatus" and the "methods and rules" include the table photometer, about which there is no particular virtue, from a practical point of view, over the bar photometer; and there are Bills before Parliament now in which Carpenter's "Metropolitan" burner No. 2 as well as the pentane standard lamp are contemplated for use with the ordinary bar. In the case of the Kidderminster Gas Bill, an opportunity was given to the promoters to consider the suitability of the clauses to their particular circumstances; so that it is probable in certain details they will, as occasion requires, be subject to modification to an extent that will hurt no one, and yet effect the bringing about gradually, but surely, of a comparable test. That is the main thing, so long as upon illuminating power is placed the now almost meaningless honour of supplying the standard of quality for gas.

The proceedings on the Gas Bills before the House of Commons Committee over which Mr. H. J. Tennant is so ably presiding, did not, so far as they went during the three days' sittings of last week, furnish any particularly noticeable incident. Two Bills have dropped from the group of eight referred to the Committee; and, from the Committee's point of view, this is not by any means a disadvantage. One was the Thornton District Council Bill, in which they are giving effect to the permissive power granted to local authorities, in the Poulton-le-Fylde District Council Act of 1901, to purchase any part of the gas undertaking of this authority situated in their respective administrative areas. The Poulton-le-Fylde District Council were originally petitioners; but all the differences between the parties have been privately composed. The other Bill which has been the subject of agreement is that of the Cardiff Gas Company; and the terms are such as the Company could concede without injury to their interests, while they confer large financial benefits on the Corporation, the ratepayers, and the gas consumers generally. The details of the settlement will be found in our "Notes from Westminster."

The Epsom and Ewell Gas Company's Bill, which was the first to be discussed before the Committee, contained only one point for consideration, as the Company had met the District Council's objections before appearing at Westminster. This was one of the Companies who in their Bills as lodged defined the illuminating power at 13 candles; but, in this case, the Company have agreed to continue their former standard of 14 candles, in order to subdue the local opposition. The one subject over which there was controversy was between the promoters and the Redhill Gas Company. The latter Company have, within their statutory area, a distant piece of rural territory known as Walton-on-the-Hill; but, in respect of gas supply, it has been, solely through the poverty of possible custom, derelict for about forty years. The Epsom Gas Company's mains are near to this area; and they asked that the Redhill Company's powers should cease, and that they should be vested in them, if the Redhill Company did not exercise them within three years. When the Bill came before the Lord Chairman, he excised the conditional term, making the power on the part of the Epsom Company to apply on the passing of the Bill. The Redhill Company naturally raised objection; and they were before the Commons Committee to sustain it. What the Epsom Company are proposing, if they succeed, will create a precedent; for the authorities do not appear to be able to bring to mind a similar proceeding. There have, of course, been many cases of the transfer of territory by agreement, but not in face of opposition by the Company in statutory possession. The upshot is that the Committee have allowed the Redhill Company eighteen months' grace, within which to furnish a supply; and if there is non-compliance, the Epsom Company will enter into possession. We shall be curious to see what action the Lord Chairman will take when the Bill reappears before him, in view of his objection to any condition attaching to the clause in question.

The only other Bill under discussion at the end of the week was that of the Merthyr Tydfil Gas Company. The cross-examination of the first witness disclosed that the Corporation were doing their best to fasten certain rather trivial delinquencies upon the Company—obviously with a view of ingratiating themselves with the Committee so as to obtain a purchase clause. This is a statutory Company; but the Merthyr Tydfil authority, like many others in preceding sessions, seem to be ignorant of the fact that they might as well try to obtain compulsory powers to purchase the Houses of Parliament as a statutory gas undertaking, unless there

has been such wilful mismangement that it is in the public interests there should be a change of ownership. Here the Company supply cheap gas; and there is no solid foundation for complaint against them, although income-tax was not deducted for some years, through ignorance, from the maximum dividend. That they have not seriously abused their position, but have endeavoured to serve the consumers well, will, we think, be the finding of the Committee as indicated by their decision.

The Progress of the Gas Industry.

Nearly all the meetings of the various Suburban and Provincial Gas Companies have now been held; and the reports and statements of accounts submitted thereat tell an almost unvarying tale of progress and increased prosperity. In most cases the usual dividends have been more than earned; while in some the rate has been increased. But perhaps the most gratifying feature, because indicating the substantial basis of this continued prosperity, is the almost monotonous record of increases in the sale of gas, or in the number of consumers, or both. Thus, at Sheffield it is reported that 4272 additional meters were fixed during the year; while for the half year ended Dec. 31 last there was an increase in the consumption of gas of 6·17 per cent., and for January and February this year it was 7·47 per cent. Thus is reflected the great improvement in trade which is manifest also from the increased dividends paid by some of the industrial companies of the district. The Directors of the Company justly call attention to their having availed themselves of every opportunity of reducing the price of gas. It is probably unique that reductions to the extent of 9d. per 1000 cubic feet have been made by this Company during the last five or six years; while a further reduction of 1d. per 1000 feet to take effect almost immediately, brings the price of gas down to a figure which cannot but defy competition from whatever source, whether for lighting, heating, or motive power. The question of a supply of cheap heating gas would appear to be robbed of much of its attraction when confronted with the fact of illuminating gas of high quality being supplied at 1s. 1d. per 1000 cubic feet for gas-engines, and from that figure to 1s. 5d. for other purposes. There still remains, however, the problem as to what extent 17 or 18 candle gas, even when supplied at these low prices, satisfies the needs of those who are, or would be, users of fuel in the gaseous form. If Mr. Hanbury Thomas or Mr. Morrison could throw any light upon it, an article on the subject would be very welcome for an early issue of the "Journal."

At Derby, also, great strides have been made during the last twelve months; the number of consumers having increased by 675, and that of cooking-stoves and gas-fires in use by no fewer than 2356. This indicates very commendable energy on the part of the Company's officials; and it is pleasing to record that their services have been suitably recognized by the Directors, who, in their turn, received a substantial recognition from the shareholders of the special services rendered by them in the acquisition of the undertakings of two neighbouring Companies. The Derby Company are, in fact, not only extending the use of gas very rapidly within what may be termed their ancient limits, but are also enlarging their borders, so as to bring the advantages of cheap gas within the reach of the large semi-rural population by which Derby is surrounded. At Walker, the number of consumers has increased by 17·11 per cent., while the gas sales were the largest on record. At Liverpool, the increase for the half year was 2½ per cent., notwithstanding a mild winter and the absence of fog. At Bristol, there was an increase during the year of meters fixed of 3309; while at Newcastle the astonishing increase for the same period is reported of 8696 prepayment, and 614 ordinary stoves, with 1898 new ordinary consumers—the increase in the sale of gas having been 2·66 per cent. In fact, from almost every part of the kingdom comes the same record of increase and financial improvement.

With regard to the latter, the curious in such matters may be tempted to inquire why the experience of the two leading London Companies should, as regards the year's trading, have been different from that of most of the leading Provincial Companies. Both showed a deficiency of profit for the customary rates of dividend, whereas surpluses—sometimes large—have been the rule. It must be remembered, however, that the circumstances in which the London Gas Companies are placed are in some respects essentially different from those of Provincial undertakings. It is not too much to say that lower prices for coke are almost wholly accountable for the recent deficiencies in the revenue accounts, in which respect the London Companies are largely dependent upon one particular trade. As is well known, the building trade has for some time past been greatly depressed, and upon this trade depends the prosperity of the cement industry, which at present affords by far the largest outlet for London gas coke. This circumstance, with its attendant consequences, makes it very desirable that fresh markets should be obtained for this product, if by any means possible. In any case, it is to be hoped that the good fortune of the Provincial undertakings will be speedily shared by the London Companies referred to.

Bye-Products from Electricity Generation.

It is not every man who has the happy gift of writing on dry subjects in a manner that will catch the public eye, and please the public taste. Mr. B. H. Thwaite, C.E., has that gift. Magnificent schemes bringing with them boundless good, even the transformation of London into a perfect Elysium, are sketched lightly by his pen. Difficulties, no matter their size, vanish under his magic touch, and—on paper—all ends well. This sort of thing pleases the public, is read, and then is forgotten. An article of this type, by Mr. Thwaite, has appeared in the "Daily Chronicle," under the title of "London Transformed: A Boon which will "follow Universal Electrification." This heading, we are under the impression, was the product of the editorial department; it savours somewhat of the New Journalism. But it is what follows, and not the heading, that is intended to be the more important. It was only just recently that the old fantastical scheme was revived for the semi-carbonization of coal in the Metropolitan Gas-Works, with the view of giving to Londoners a smokeless fuel, and so ridding them of the foulness of the winter fogs. The London Gas Companies, for excellent reasons, have never gone into ecstasies over this imagined possibility of the lay mind. But it is now Mr. Thwaite who is transferring a very fair resemblance of this idea to the electricians—accompanied by argument of much the same quality as the previous samples. We are all agreed that, if the whole of London's heating and cooking and industrial work were to be done by a smokeless fuel, London would be a much more delightful place than it is at present in the winter time. The consumption of coal in the domestic and factory fire-grates of the Metropolis is placed by Mr. Thwaite, on a low estimate, at 7 million tons. Now he assumes that the naphtha and the other products of tar distillation, and the nitrogenous elements lost by the barbarous methods of burning this quantity of coal, are worth 4s. 6d. for every ton so used; and therefore the potential value of the products thus ruthlessly destroyed is £1,575,000. "This amount is the actual possible profit that might," Mr. Thwaite believes, "be obtained by the adequate applica-"tion of the resources of modern science." Excellent!

The County Council (to the discomfiture of many) are now promoting a Bill in Parliament for the prosecution of an electricity-in-bulk scheme, which their own financial advisers tell them will, if allowed, result direly for the Council and for the ratepayers. Then blessed be the name of B. H. Thwaite, for has he not shown them where there is £1,575,000 waiting for them to pick up annually by applying to their scheme the resources of modern science, as well as relieve London of its grossly polluted atmosphere? Mr. Thwaite once formulated the same idea for Berlin; but it is not within our knowledge that the plan got farther than the stage at which Mr. Thwaite left it. But the proposition is so simple; being concentrated in the employment of modern bye-product recovery coke-ovens erected alongside the bulk power generating-stations, and of such proportions as will eventually recover the valuable bye-products from "all the coal" other than anthracite brought into London by sea and by rail. "*All* the coal!" Then the Gas Companies are, under this comprehensive project, to be wiped out of existence. There seems to be confirmation of this view lurking within the capacious mind of Mr. Thwaite, as, right in the forepart of his article, where he lets the reader gently into the depths of his great idea, he says "the County "Council would secure profit that would be comparable to "the profits that had been for many years consistently "secured by the London Gas Lighting Companies." The

gas from the coke-ovens would be (of course, we must assume that Mr. Thwaite means partially, seeing there are 7 million tons of coal to be treated) used for operating large-capacity gas-engines for satisfying the bulk-electrical requirements of London; and the coke—white and silvery, and distinct from the dirty retort coke—would be broken into regular pieces for motor-waggon transport to London households. In order that everything shall come out as predicted, the markets must be unfailing in bearing the great additional inflow of tar and "nitrogenous potentials" without modifying prices. But for that it may be supposed Mr. Thwaite will arrange. This, however, is the scheme. In London's waste of fuel are stored the means of getting electricity in abundance, and products to the extent of £1,575,000. All this is waiting simply for the County Council to take possession. Strange to say, we have not heard of any unusual excitement in the neighourhood of Spring Gardens over the revelation that the way has been found for bringing to a happy conclusion their much despised scheme.

Formation of an Illuminating Engineering Society.

It is suggestive of the progress of events that a need should have arisen for the formation of a Society to take cognizance of, and promote on scientific lines, the various methods of public and private lighting which are now in use. So long as candles and oil lamps held sway, the methods of using them could safely be left to individual enterprise. So, too, when gas was introduced, it seemed but natural to leave the gas expert to show how it could be applied to the best advantage. It can scarcely be said that this invariably succeeded; for it is to be feared that, under the old gas *régime*, gas consumers were left very much to their own devices. Moreover, there was little choice of method in the use of gas, the appliances for which were more often than not hallowed by time, and venerated as family possessions not to be lightly parted with. Now, however, all this has been changed. The flat-flame burner is fast giving way to the incandescent mantle; while there are competing forms of lighting in the shape of electricity and acetylene, to say nothing of the application of oil under modern conditions. With all these additional sources of illumination, there has been an ever-growing desire for more light, the requirements of the public for which become more and more exacting.

It is not, therefore, by any means surprising that there should be a tendency to specialize the art of illumination; and to this tendency encouragement has now been given by the formation of a Society in New York. It includes more than 180 members, and embraces representatives of all the various methods of lighting. To what extent these are likely to work together remains to be seen. Probably it will be decided to work in sections; for certainly, if the conditions are similar in America to those of this country, there can be but little in common with the electrician and the gas maker, unless these are incorporated in the same individual. Apart, however, from this apparent incongruity, the idea of working up the art of illumination seems to be excellent, and ought be productive of good results. It is one that might very profitably engage the attention of the Institution of Gas Engineers, with, as a matter of course, special reference to the use of gas. The modern system of incandescent street lighting is susceptible of improvement—the kind of lantern best suited for the distribution of light and the protection of the mantle, and the design and height of the column, both, among others, being fit subjects for investigation. For domestic lighting, the hygienic advantages of gas claim first consideration; although a great deal might be done by the enunciation of correct and economic principles of the distribution of light, having due regard to all the surrounding conditions.

The first list of papers to be read before the new Society comprises one on the "Inverted Incandescent Gas-Burner," and another on "Illuminating Engineering from the Archi-" tect's Standpoint." Both are excellent subjects, and well calculated to promote very useful discussion. Among other subjects suggested by the President are, in addition to street lighting, "Candle Power Rating of Illuminants," "Light-" ing, with Special Reference to Ventilation," and "Æsthetics "*versus* Utilitarianism in the Design of Fixtures, Globes, "Shades, and Reflectors"—all of them excellent, and well calculated to promote the objects for which the Society has been formed. We heartily wish it every success.

The Power and Heating Gas Question at Burton.

Burton-upon-Trent has decided to "take the bull by the horns" with reference to the threatened competition of private producer-gas plants. There can be no doubt whatever, from the statements made by the Mayor (Alderman Lowe) at last week's meeting of the Town Council, that the Gas Department were in imminent peril of losing many of their power gas consumers, if they did not make a substantial reduction in price; and the question the members set themselves to discuss was whether or not they should endeavour to retain this custom by the only means which suggested itself. They decided by a very large majority that they would do so; and hence the large power consumers are in future to have their gas on exceedingly advantageous terms. Of course, the sweeping reduction in price determined upon could only be offered at a very large sacrifice of profit; but it was pointed out that though the new scale would reduce the receipts by between £500 and £600 a year, the department would, even at the lower rates, still be receiving a very considerable contribution from this class of consumer towards the fixed expenses—which would remain the same even if the big manufacturers ceased to take their supply of gas from the Corporation. In one respect the Committee's proposal was improved upon as a result of the debate in the Council, and that was by the substitution of a minimum annual consumption to secure the benefit of the lower prices, in place of the suggested quarterly figures. But this, of course, is quite apart from the principle volved—being merely a matter of detail. We trust that the somewhat heroic measures taken will not only enable the Corporation to retain their present power and heat consumers, but will induce an increased use of gas for these purposes. It is quite possible that if the consumers had been left to carry out their threat of installing suction producer plants, they might have ultimately returned to coal gas as being the better of the two; but nevertheless the Council have done well not to rely upon this chance. The throwing out of use of a private gas-producing plant, once it was installed, would require an amount of courage that might quite conceivably not be possessed by all the converts to suction gas.

Gas Consumer and Ratepayer.

In connection with the consideration of the advisability of making a reduction in the price charged for gas at Blackpool, a Sub-Committee have had submitted to them by the Borough Treasurer a report which bears on the relative interests of gas consumers and ratepayers. It will be seen from a statement appearing elsewhere that the Sub-Committee are of opinion that a large sum should be contributed to the relief of the rates, rather than that the ordinary consumer should have gas cheaper. How this affects the people of Blackpool is shown by the report, the object of which was to discover what would be the variation in the payments of various classes of consumers between an increase of 1d. in the pound on the rates and a decrease of 1d. per 1000 cubic feet in the charge for gas. Naturally, the hotels and the places of entertainment, where electricity is largely employed, would lose by a reduction in the price of gas and an increase in the rates; but it is not easy to see that any injustice would thereby be done. On the contrary, big gas profits give them an advantage to which, as users of electricity, they cannot fairly lay claim. On the other hand, it is found that boarding-house keepers and private residents occupying large or small houses stand to benefit by a reduction in the price of gas; while of certain shops taken as examples, some would gain and others lose. Whatever the figures may prove as regards the effect on different classes of ratepayers of a rise of 1d. in the rates and a reduction of 1d. in the price of gas, the fact must remain that those persons who are liberal consumers of gas must, by the appropriation of substantial sums from the profits of the undertaking for the relief of the rates, be assisting to lighten the burdens of those who use little or none. This is a point that cannot be got away from. If everyone consumed the same amount of gas and all paid the same sum in rates, big gas profits would not entail a hardship upon anyone, though even in that case it might well be considered preferable for the municipal expenditure to be levied directly as rates. As things are, however, it cannot be denied that a profit on gas is another name for a tax which is borne in unequal proportions by one section only—though doubtless a very large one—of the ratepayers.

Cheaper Gas at Sheffield.

The proceedings at the half-yearly meeting of the Sheffield United Gaslight Company were of an unusually brief character; but what transpired was eminently satisfactory. The shareholders had the gratification, as is pointed out elsewhere, of learning that there had been an increase of over 6 per cent. in the gas sold during the past half year, as compared with the last six months of 1904; but an even wider interest attaches to the notification that there is to be a further reduction of 1d. per 1000 cubic feet in the price of gas, as from the 1st prox. This will make the charges 1s. 5d., 1s. 3d., and 1s. 1d. per 1000 cubic feet, according to consumption, and 1s. 1d. per 1000 cubic feet for gas-engine purposes.

Relieving the Rates.

An enlightening report by Alderman Ewing Matheson, the Chairman of the Leeds Electric Light Committee, appeared last week, on the subject of the present position of the undertaking —"as an aid to the consideration of certain questions which will shortly have to be dealt with." The chief point of the report appears to be that a sum of over £16,000 which has been taken from the "profits" in relief of the rates has by subsequent events been shown to have been not properly so applicable; and the suggestion is made that if this amount (with interest) be refunded, and no further sums withdrawn, the undertaking will probably be able to meet all claims upon it. It is stated that, while the capital expenditure per kilowatt is more favourable than that of electric supply companies on the average, the burden on the Leeds undertaking is excessive when compared with municipal electrical concerns generally; but that this apparent over-capitalization is more than accounted for by the estimated premium on stock issued in payment for the undertaking. Two of the recommendations contained in the report (which has been adopted by the Council) are that any surplus up to 3 per cent. on the entire capital be placed to a reserve fund for renewals, until such provision is found to be unnecessary or excessive; and that no further sums shall be applied to the relief of rates until the renewals now contemplated are fully provided for, and the liabilities on capital account are reduced to the average for municipal undertakings—"after which the question may be reconsidered."

How to make Electricity Pay.

In the history of municipal electricity supply are described many new and wonderful artifices for making such undertakings possess a seeming profitableness. Another one came to light in the course of a Local Government Board inquiry at East Ham last week, when the Council asked for power to borrow an additional £18,750 for electric lighting purposes. Strenuous opposition was offered on the ground of the heavy indebtedness of the borough—£940,980—and the present rate burden of 10s. 4d. in the pound. There was talk of the "profits" of the electricity undertaking. Mr. R. H. Hooper, the Inspector, looked into this matter of profits a little; and one of the peculiar financial methods of the East Ham Electricity Department that he discovered was that there were *permanent employees* engaged in electric lighting work who are *paid out of capital* account. The astonished inspector's comment—that "such moneys should not be paid out of capital, but out of revenue"—was the only one he could at the moment command. Of its soundness the East Ham Electricity Department are as well aware as Mr. Hooper; but it meets their views to give the revenue account as good a present appearance as circumstances will allow. Where it is the municipal policy to charge as much as possible to capital, the future may be viewed by the ratepayers with apprehension. We hope the Local Government Board will administer a sharp rebuke to the Borough Council over this business, and see that the local Press obtains possession of their communication. Also that the Committee appointed by the President of the Board will make a note in their report of this particular "system" of municipal account keeping. The "Morning Post," the "Daily Mail," and no doubt other papers, made reference to this payment of permanent employees out of capital and not revenue; the "Stratford Express" —a local paper—did not. We wonder why. Is it that the local influence of Borough Councils is sufficient to suppress unpleasant revelations affecting municipal administration?

NOTES FROM WESTMINSTER.

Modesty characterizes the opening of the work in the Committee Rooms; and there is little prospect of anything big being done this side of the Easter recess. There have been three Committees sitting for a few days—one Lords and two Commons; and an additional one from the Upper House will set to work the second half of this week. Group A in the Commons paper was constituted of eight Gas Bills; and exactly one-half will by this time have been disposed of, seeing that two are going forward unopposed—the Thornton District Council Bill, and that of the Cardiff Gas Company; while the Epsom and Ewell Gas Company's Bill has, on the only contested point, been dealt with, and, at the time of the early termination of the sitting on Friday, the Merthyr Tydfil Bill had made excellent progress. There are four other Bills before the same Committee —Dowlais, Watford, Uxbridge, and Rochester. The Committee is very representative of the House of Commons of to-day. Upon it we have (in the Chairman, Mr. Tennant) the son of a baronet, the son of an earl, a member of a good county family, and a member of the Labour Party. The Committee of the Lords, who will be meeting this week, have Bills of a mixed character to consider; among them being the Gas Bill of the Wolstanton District Council and two Water Bills. The position of the Electricity Power Bills for London is growing more and more interesting; and in connection with them, the strength of the municipal section in the House is being more and more felt. There is talk of an immense fight between the London and Glamorgan County Councils over the Water Bill of the latter. "Welsh water for Wales" is the cry; and, of course, the Welsh members are doing their best to back up the Principality. The London County Council members, aided by a substantial following of Progressives in municipal politics, will no doubt do their utmost to wreck the Glamorgan measure.

Model Gas-Testing Clauses. Promoters of Gas Bills in which the question of illuminating power is dealt with will find the proceedings before the Lord Chairman on the Kidderminster Gas Company's Bill—as reported in our "Parliamentary Intelligence," and referred to editorially—of supreme importance. The drafting of a set of clauses—prescribing that the testing of gas shall be in conformity with the methods defined for the Metropolis — for application where they are suitable as gas undertakings appear in Parliament, will do more than anything else to bring about the unification of gas testing in this country, so that comparable results can be secured. As long as the test prescribed as a standard gives to the gas its best possible power, no one will have any ground of complaint—not even the customers of gas companies, for in most cases the sliding scale and competition will ensure that no injustice is done; while, in the case of many municipalities, the gas consumers' protection in regard to quality will be precisely of the same modest order as heretofore. Therefore, no one will be injured, but something will be gained.

Cardiff Gas Settlement. A private meeting on Tuesday evening between the representatives—expert and administrative—of the Cardiff Gas Company and the Cardiff Corporation practically put an end to all necessity for submitting the Bill of the former to Mr. Tennant's Committee. The Bill is one of those broad measures that envelops within its pages almost everything possible in the way of modernizing and extending powers. There is an enlargement of the area of supply, the purchase of the gas-works (not the water-works now) of the Taff's Well Gas and Water Company, the consolidation and conversion of capital, new capital, and reduction of illuminating power. As to the last-mentioned matter, the Company are coming down from 16 to 14 candle power, tested (using the table photometer and the 10-candle pentane lamp) by any burner approved by the Board of Trade. As the "Metropolitan" burner No. 2 is now the approved standard, the whole test may be said to be defined, even if the new testing clauses do not find their way into the Bill in the course of its passage. The terms of the settlement are these: The total amount of new stock and loan powers sought was £533,333. A renewal fund equal to one-tenth of the capital (or £85,000) was suggested; while the prescribed sum for the reserve fund was £75,000. These various amounts total to £693,333. Instead of this sum, what the Company are, by the settlement, to have is £535,000, made up in this way: £300,000 stock, £100,000 loan on debenture, renewal fund £70,000 (not to commence until five years after the passing of the Act), and reserve fund £65,000. Debenture stock is to be of a class not exceeding 4 per cent. Then, in connection with the reduction of illuminating power, the people of Cardiff are benefiting largely. The maximum price is to be reduced from 3s. 6d. to 3s.; and in the out-districts to 3s. 3d. The present price of gas is 2s. 9d. per 1000 feet; and the Company have agreed to a twopenny reduction, split up into two periodical stages. A penny is to come off at the June quarter, and a second penny at December—making the price 2s. 7d. Then, in regard to street lighting, the present price is 2s. 5d. per 1000 feet; and the Company are going to lower it to 2s., in three stages—2d. at June, 2d. at December, and 1d. in June next year. The maximum price is to be 2s. 2d., or not less than 7d. below the charge to ordinary consumers. In regard to the opening of roads, the Liverpool agreement is to

be applied, whereby, after the work is done, the roads will be handed over to the Corporation for reinstatement at the cost of the Company. The Company were advised by Mr. Corbet Woodall, Mr. H. E. Jones, Mr. E. Herbert Stevenson, and Mr. William Cash, F.C.A.; and the Corporation, by Mr. J. G. Newbigging and Mr. Isaac Carr.

Annexation. By allowing the illuminating power of their gas to remain at 14 candles, instead of going down to 13 candles, and probably by some concession on matters of minor importance, the Epsom and Ewell Gas Company, of which Mr. H. E. Jones is the Chairman, came before Mr. Tennant's Committee with a novel proposition—that from the Redhill Gas Company should be taken a part of their district (to wit, Walton-on-the-Hill) which they have allowed to remain undeveloped over the long course of forty years for the very sufficient reason that there has not been the custom to justify them in laying mains such a distance. The Epsom Company maintain that the position is precisely the same to-day—that it will not pay the Redhill Company to sink their capital in laying a long stretch of mains, but that it would pay the Epsom Company, who are in a handy position with their pipes, and can at once give the benighted inhabitants all the blessings of a gas supply. Walton-on-the-Hill is a pretty part, and is now developing; so that the Redhill Company are naturally not desirous of abandoning any prospective advantage, although the immediate one for them may not be very great. On the other hand, it is hard on the people of Walton-on-the-Hill that, with a gas-main in their proximity, they are to be denied a supply of gas until there is sufficient custom to assure to Redhill a profit on their enterprise in running a main there. The Directors of the Redhill Company (for whom evidence was given by their Engineer and Manager, Mr. James Paterson) decided some time since to go part of the way towards Walton, to supply another village; so that, as the evidence almost leads one to suppose is the case, the carrying of gas to Walton-on-the-Hill does not mean incurring capital expenditure on five miles of pipes specially for the small population in existence there at the present time. The Redhill Company have, we believe, now fully made up their minds on the question of going the whole way, and as quickly as possible. The position is a little complicated, however. The clause in question in the Bill as introduced was a suspensory one, which purposed giving to the Redhill Company three years in which to carry out their obligations to Walton-on-the-Hill; but, otherwise, the powers were to fall into the hands of the Epsom Company. The Lord Chairman refused to allow any time-condition to be attached to the clause, and he made the power to apply with the passing of the Bill. The Commons Committee, however, think it only right that the Redhill Company should be permitted time in which to carry out their powers before being finally deprived of them; and so they have suspended the operation of the clause for eighteen months—giving the Redhill Company time to take a hasty flight to Walton if they see fit. If they do this, the act will abrogate the clause; if they do not, the Epsom Company will step in. What Lord Onslow will think of the modified condition remains to be seen. But whatever happens, it will be an undying consolation to the Epsom and Ewell Company to remember how they hurried the best of artificial lights to those who were sitting in comparative darkness at night time in the district of Walton-on-the-Hill.

Merthyr Tydfil Gas. The Merthyr Tydfil Gas Company are bound to have additional works, especially for storage purposes; and while they are in Parliament seeking the necessary authorization (financial and otherwise) for this purpose, they are asking also for other useful powers—such as the conversion and consolidation of their capital on a 5 per cent. basis, the application of the sliding-scale with a 3s. standard, land for new works, £60,000 of additional 5 per cent. capital, and the bringing up to date of the test for illuminating power. The Company are supplying at the present time at 2s. 10d. per 1000 cubic feet; and, so far as the cross-examination of the Company's witnesses had proceeded at the close of Friday's sitting, one is a little unsettled as to the direction in which the Corporation are of opinion that the strength of their case rests, or what they are going to gain by a long inquiry before the Committee. Perhaps, as the case proceeds, and the evidence for the Corporation is presented, the frailties of the Company will be opened to view; but certainly up to the end of last week's work nothing had been revealed of which there was any special reason for the Company to be ashamed. True they have paid income-tax over and above their maximum dividend; but they stopped doing so directly they learnt that it was wrong. The Local Authority, however, who are the persons whose duty it is to see that the Company do not transgress, were manifestly (seeing that the Company's accounts were sent to them year by year) equally oblivious of the fact that maximum dividends should be less income-tax. The Merthyr Company are not the most important of gas companies who have been doing the same thing right up to recent years. The Corporation also appeared to be entertaining some idea that this session of all sessions is not a bad one, with so many Members of Parliament fresh from the municipal school, in which to talk of municipalization; and to get a purchase clause imposed upon a statutory company. They began interrogating the Company's witnesses on this matter; and Mr. H. P. Linton, the Chairman of the Company, scored when he answered Counsel, that he thought "it would be more to the purpose if the Corporation paid off some of their existing debts before they incurred more expenditure in buying gas-works." However, at the time of writing, it seems pretty clear that the Corporation are not going to succeed where others have failed year after year; for on Thursday afternoon the Chairman of the Committee told Counsel for the Corporation that "he [the Chairman] did not think Counsel need labour the point." Special protection for water-mains was being sought by the Cardiff Corporation and the Glamorgan County Council, in respect of leakages from ancillary pipes used for the conveyance of the liquid bye-products, which "might" contaminate the water in the mains. It appears that the Cardiff Corporation have similar special protection in connection with the gas-mains. This was considered to be a matter for clauses, and so was not discussed at any length. Mr. Corbet Woodall, Mr. H. E. Jones, Mr. E. H. Stevenson, and Mr. William Cash, F.C.A., were retained on behalf of the promoters; Mr. W. A. Valon, Mr. Charles Hunt, and Mr. E. W. Drew, F.C.A., for the Merthyr Corporation; and Mr. C. H. Priestley, the Borough Water Engineer, was present on behalf of the Cardiff Corporation.

London Electricity Bills. Sir Henry Campbell-Bannerman has now definitely stated that the Government have no intention of appointing a Commission to inquire into the general question of the electricity supply of the Metropolis, as has been thought would be advisable in view of the number of new schemes, the number of the existing undertakings, the vastness of their invested money, and the injury with which their interests are threatened by the new schemes. The announcement has intensified the feeling that the Government in this matter are aiding the little plot to reject on second reading all the London Electricity Bills, excepting that of the County Council. The London Liberal members have decided to do their part in effecting this. On the other hand, the Unionist members, at a conference last week, declared their opinion that the County Council measure ought not to be passed in its present form, and that the whole of the Power Bills ought to be referred to a Select Committee. There is indubitably a great deal of truth in what Mr. W. J. Fisher, the rejected Liberal candidate for Canterbury, said at the recent meeting of the Metropolitan Electric Supply Company: "Being in close touch as I am with the Government policy, I am convinced that no scheme for the extension of private interests has the smallest chance of success." The statement of the Prime Minister has been received with undisguised joy by municipal extremists, who publicly state—surely against their private convictions—that already there has been adequate inquiry into the problem of the Metropolitan Electricity Supply. We maintain that there has not been. Inquiry has only had reference to private schemes; and inquiry would give the opportunity of showing up what the extremists do not want brought into too strong a light—that the glaring mismanagement and vicious accountancy in connection with municipal electricity supply in London has brought monstrous burdens upon the ratepayers. It would also show that those burdens will be aggravated by allowing the County Council to carry out their scheme at a cost of millions of pounds. The Council's own Finance Committee predict loss on the scheme; and beyond this loss, it must not be overlooked that there will be the depreciation of the earning capacity of the existing municipal concerns if the scheme goes through. The municipal undertakings have to struggle now, and resort to strange expedients, to put a good complexion on their accounts; what will happen afterwards if the County Council scheme is developed, the ratepayers will learn all too soon.

German Rules for the Erection of Gas-Fires.

It may be remembered that a code of rules for the construction and erection of gas-heating apparatus was drawn up by Professor Rietschel and presented to the German Association of Heating and Ventilating Engineers at their annual meeting held some three years ago. These rules stipulated that (1) fires with non-luminous flames, and those with descending passages for the products of combustion, should not be used; and that (2) the flues should project at least 5 feet above the roof, be provided with draught caps, and should not be placed in outside walls. These rules were naturally not considered to be judicious by the German Association of Gas and Water Engineers, who accordingly invited Professor Rietschel to a conference on the subject. The discussion took place last December, and in consequence the following code was adopted: (1) Gas-fires must be connected to an efficient chimney for the removal of the products of combustion. (2) The fires are to be constructed and erected in such fashion that, even if the chimney does not draw well, or fails to act for a time, no incomplete combustion of the gas may occur, nor the flames be extinguished. The German Association of Gas and Water Engineers hope to draw up, at no distant date, a detailed code of rules for the construction and erection of gas-heating apparatus, towards the formulation of which Professor Rietschel has already contributed some useful matter.

The Manchester and District Junior Gas Association will meet next Saturday, when two papers are to be read. The first will be by Mr. F. Thorpe on "Some Methods of Gas Measurement," and the second by Mr. J. Hall, entitled "Railway Carriage Gas Lighting." On April 28, a visit will be paid to the Bolton Gas-Works; and on May 26 there is to be a joint visit with the Yorkshire Junior Association to the New Wortley Gas-Works, Leeds.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 815.)

THE course of things on the Stock Exchange did not run altogether smoothly last week; for the tendency was apt to shift its direction, sometimes chopping round somewhat unaccountably. The week was inactive all through, there being little disposition to launch out. The opening was dull—Moroccan obstacles setting the tone; but after a couple of days or so, things looked as if they were going to brighten up. But despondency supervened next day, and a dark view was taken of the general outlook. This was as suddenly displaced on Friday by a recovery, the cause of which was not quite clear; and thus it stood up till the close. In the Money Market, there was a good demand for short loans; and discount rates hardened steadily until nearly the end of the week, when they relaxed. In the Gas Market, there was a decided reduction in point of volume below what has recently ruled as a fair week's average, and there were very few variations in value. But wherever a quotation did happen to change, it was always for the better; while general firmness characterized all the rest. In Gaslight and Coke issues, transactions in the ordinary stock were only moderate. Prices at which stock changed hands ranged from 98⅜ to 99½; and at the close they were good enough to warrant an advance in the quotation. But it was left standing. There was not much doing in the secured issues; but they were very firm. The maximum changed hands at 89⅓ and 90, the preference at from 108⅛ to 109 (with an advance of a point in the quotation), and the debenture at from 89 to 90. South Metropolitan was not active but steady—all transactions being within a range of from 128 to 128¾. The debenture was done once only at 89½. Commercials were almost wholly neglected. There were only a couple of transactions in the 4 per cent. at 114½; and none at all in the 3½ per cent. or the debenture stock. There were a few dealings in the Suburban and Provincial group, which exhibited their usual strong position. Alliance and Dublin new rose ½, without any business done in it. Bournemouth "B" marked 17⅛, Brentford old 263, and Brighton original 232 (with a rise of 3 in the quotation). British changed hands at 43⅛, South Suburban at 121½ and 122, West Ham ordinary at 107½ (with a rise of 2 in the quotation), and ditto debenture also rose a point. In the local Exchange, Liverpool "B" had a further advance. The Continental Companies were as quiet as the rest, and unchanged. Imperial was done at 232 special, but other transactions were between 233 and 234½; and the debenture marked 96 and 96½. Union ordinary was done at 130, ditto preference at 145, and European changed hands at 23. Tuscan marked 10¼. Among the undertakings of the remoter world, Buenos Ayres marked 12¾, Primitiva ordinary 7 5/16 and 7¼, ditto debenture 99, Cape Town debenture stock 101⅜, Ottoman 6¼, and Melbourne 4½ per cent. bonds 104½.

The closing prices are shown in our Stock and Share List on page 815.

ELECTRIC LIGHTING MEMORANDA.

The Electricity Consumer a Victim of the Lamp Manufacturer and Vacillating Currents—Consumers Return to Gas—Ineffectual Remedies—Secondary Photometry—The Wiring of Consumers' Houses—Electrical Work and the Price of Copper—Flame Arcs.

As usual during the winter season, the Local Sections of the Institution of Electrical Engineers have given forth a mass of technical matter, the greater part of which does not call for notice by us. From among the papers, a couple have been placed on one side for notice. To one of them, by Mr. George Wilkinson, on "Waste in Incandescent Electric Lighting, and Some Suggested Remedies," there has already been incidental reference. As competitors of electricity, it may be openly confessed that the question of whether or not consumers of electricity get the expected value for the money they expend, is not a matter of indifference to us. Testimony that they do not recurs with a frequency that cannot be pleasant for those station engineers who would fain hide the truth. Mr. Leon Gaster has twice of late publicly given voluminous confirmation of the general experience of the inconsistency of electric carbon-filament lamps—of the fact that they do not do what the markings on them declare they should do, of their rapid depreciation, and of the detrimental effects of irregularities of voltage, the correctness of all of which Mr. Wilkinson attests. His paper is full of deprecation of incorrectly graded and inefficient lamps, and of the persistent use of lamps after they have become blackened on the inner surface of the globe. So marked is the lamentable waste, and "its effect upon the future of electric lighting so serious," that it is, he holds, high time some definitely-concerted action was taken by the supply authorities throughout the country to deal effectively with the matter, and to educate every consumer so that he may know how to get efficient electric lighting at reasonable cost.

This is what sapient electricians have been saying for years; but they have not advanced far in securing what they know to be necessary. This shows the difficulties are great; and, though there have been a multitude of counsellors bringing their collective wisdom to bear on the matter, they have not surmounted the troubles. The recipes for amendment have been many, but futile. Fault rests in several directions. A private electricity consumer is, in the matter of the illuminating value he gets for the money he pays, at the mercy of the vacillating currents and the vagaries of the lamp manufacturer, as well as the victim of his own ignorance. Against what he suffers between the lamp maker and the electrical engineer, he is defenceless; but for what results from his own ignorance, he cannot be pitied. If he is wise himself, he cannot—Mr. Gaster, Mr. Wilkinson, and others admit it—have perfect confidence in his electric lamps. The result is, Mr. Wilkinson says, that not a few lucrative customers have gone back to the use of gas; and Mr. H. Dickinson asserts (in the discussion of the paper) that "incandescent gas is a serious competitor in Leeds, and some people are taking out electric lamps from inside their shops, while retaining them for the shop windows." Here is the answer to the tittle-tattlers in the electrical press who write as though gas suppliers are in dreamland when they declare the experience of Harrogate and of Leeds to be their own.

Mr. Wilkinson quotes "*a few* of the *many* cases which have come under his personal notice," and under that of other engineers, of lamps in public buildings, private houses, and shops, the consumption of which is considerably in excess of what it should have been according to the grading and marking. "Some quite as shocking examples," Mr. Acland, of Chesterfield, asserted during the discussion, have been found by him; but other engineers appeared disposed to think the statements somewhat magnified the facts. Perhaps these gentlemen do not seek for, and therefore do not find, the many consumers who are using the maximum of energy (to be paid for) for the minimum of lighting power. But there was accord as to the existence of trouble; and the remedies suggested were as varied in their nature as the illuminating powers derived from the same lamps by the consumers. The tendency in the discussion was to think that the remedial measures should be applied at the consumers' ends of the cables. Inspection was advocated, free lamps, lamps at a discount, and maintenance; circulars as a means of educating the consumers have not so far been generally found effective. But there were one or two engineers who also gave prominence to the difficulty of regulating pressure, which is a daily increasing difficulty, owing to the intermittent demand for power. Mr. Wilkinson went so far as to advocate that, if motors interfere with the lighting regulation, they should be put on separate circuits, because the lighting is the "backbone" of the electrical business, and the most profitable part. What a lot could be written on this admission from the point of view of the injustice to the "backbone" of what electrical undertakers are doing in the way of supplying current for heating, power, and other purposes at cost price and less.

Mr. Wilkinson is favourable to the certification for consumers of new lamps by the electricity suppliers; but other electricians are of opinion that certification would be best performed after the lamps have been in use a time. Following the lead of the National Physical Laboratory, for the purpose of this certification photometric tests by the aid of incandescent electric lamps standardized by the Bushey establishment, is suggested by the author. In this connection, the veracity of the standard pentane lamp is called in question by him. We wonder whether this has a foundation of actual experience on the part of Mr. Wilkinson, or whether it is merely a parrot-like repetition of what has been heard before from the National Physical Laboratory. Perhaps Mr. Wilkinson does not recognize that the electric incandescent lamps would be standardized at Bushey by the aid of a pentane lamp as the primary standard. Perhaps, too, the photometrists of the National Physical Laboratory have learnt, since they first of all promulgated their distrust of the pentane lamp as a model of rectitude, that, with proper use, it is not such a bad sort of instrument after all. Why do not the authorities of the National Physical Laboratory publish information as to the tests they made by which they established, or thought they established, that the pentane lamp was not to be trusted, and tell us whether subsequent experience has shown that their former tests were in some way vitiated?

It was only the other day that attention was being directed in our editorial columns to a little observed favouritism on the part of builders towards electricity during the building of houses. The second paper which has to be noticed touches upon this question. The author was Mr. R. Robson, who was anxious to get the views of the members of the Newcastle Local Section of the Institution of Electrical Engineers on the best means of obtaining a thoroughly good installation for a low figure for small dwelling-houses. But there was not much satisfaction in the result. With cheapness in electric wiring invariably goes trouble of a more or less serious nature. One does not get very far into this paper before arriving at the conclusion—after reading what has already been said about private consumers' lamps—that the customer of the electricity undertaking is very hardly done by, and that the gas consumer is a very favoured person. Wasteful and troublesome lamps do not comprise the sum of the electricity user's difficulties. Before the lamps, come the wiring installation; and for that the consumer has to pay heavily. Mr. Robson informed his audience that, while gas-pipes in six or seven roomed houses can be put in for less than 7s. 6d. a point, good electric wiring, in close-joint tubing, costs, at the very lowest, 9s. or 10s. per point and switch for wiring only; but when, as we proceed, it

is found that the close-joint system is an abomination in the eyes of Mr. Robson, and that he is still "compelled" to use it in large quantities, the hope fades of getting anything cheaper without at the same time being nasty and dangerous. This close-joint system, he says, is adopted in 99 cases out of 100; and therefore one may feel some little anxiety for friends who happen to be users of the electric current when later in the paper it is learned that, in Mr. Robson's opinion, close-joint tubing is responsible for at least four-fifths of the electrical fires occurring—the system appearing to lend itself particularly to bad workmanship.

Dangers and troubles to which electric installations are subject formed almost as large a part of the paper as alternative wiring proposals. Good cable run on split insulators along joists, and through the joists in separate holes, and brought down in insulating tubing if inside the walls, or if outside in a piece of casing, seems to be the system to which Mr. Robson is partial as meeting the principle he lays down, that "wiring must only be cheapened by adopting a system that is simple, and can be erected quickly, and last a long time without repair." One objection to it is that it gives no mechanical protection to wires placed under floors, and another that a neat job cannot be made of it, but, if down-leads are covered, it is thought that the system "might be rendered passable." That seems to be the system favoured by Mr. Robson to get cheapness; but we question whether it would obtain popularity among electricity consumers. Those who can afford electric lighting will prefer something better than what an electrical engineer thinks "might be passable." Electrical engineers are bent on making their *confrères* of the gas industry blush. In Mr. Wilkinson's paper and in the discussion, as has been seen, complimentary remarks were made about gas turning out electric lighting; and here in Mr. Robson's paper it is read: "We are letting gas get ahead of us, and we must look out for ourselves, or we shall lose ground again—so many improvements have been made in the gas world lately."

From wiring to the price of copper is not a far cry. An article which bears the impress of intimate knowledge of the general position of the copper market appeared early this month in the "Financial and Commercial Supplement of the Times." It was recently pointed out in the "Memoranda" that the price of this commodity (which takes such prominent place in electrical work) has of late advanced considerably, and that this must largely affect capital and renewal costs. The world's production of copper last year increased by nearly 75,000 tons, and the price of standard copper rose during the year by £11 per ton, and that of refined copper by £16 10s.—the price of standard copper being in December £79 per ton. It is, of course, natural that activity in the provision of works and plant for the generation and distribution of current for lighting, traction, and general purposes should persuade those who have this activity under their eyes that to it is due the great rise in copper; but the writer in "The Times" article assures his readers that, large as is the requirement for electrical purposes, it is very much larger in the general engineering and shipbuilding trades. This is doubtless true; but at the same time, the electrical industry draws enormously on the market, and with an ever-increasing demand. Of course, there is no sin in the industry doing this; but it is only natural that the increase in demand from all the copper-absorbing industries coming simultaneously must have the effect of sustaining prices, and keep at a higher level than would otherwise be the case the cost of new work and replacements. While there has been an inclination in the market lately to push prices back a bit rather than allow them to go higher, the effect can be but temporary. For it appears that last year the high prices caused sellers to deplete stocks purchased at lower figures; and there is no indication of a slackening in demand, though one authority has told us that it has had the effect of checking work that can conveniently be postponed, in the hope of getting the material at lower prices.

Any one walking towards Blackfriars Bridge Approach about seven o'clock on Monday evening last week must have had his or her attention attracted by a fairly large crowd watching one of the four show flame arcs there making spasmodic attempts to perform its ordinary functions. But after a time the lamp gave up the attempt, and the amused crowd dispersed. The lamp is fixed on one of the much-needed refuges at this large open space; and, for the prevention of accidents, it was deemed advisable (notwithstanding the presence of three other flame arcs in the neighbourhood) to station a couple of policemen by the refuge to keep the feet of wayfarers from stumbling and the drivers of vehicles from producing further trouble. The City police do not like these flame arcs; and the Corporation will think seriously before they commit the busy streets of the City to the dangers of such an erratic means of lighting.

Informal Meeting of Scottish Gas Managers.—We learn from Mr. W. B. M'Lusky, of Perth, the Convener, that the twenty-third annual Informal Meeting of Scottish Gas Managers will be held in the Grand Hotel, Charing Cross, Glasgow, on Wednesday, the 4th prox., when Mr. W. M'Crae, of Falkirk, the President, will deliver an address. There will be no formal papers; but, as usual, questions affecting the gas industry will be submitted for discussion. The Committee of the North British Association of Gas Managers are expected to be present and to take part in the proceedings.

AN INTERNATIONAL EXHIBITION IN DUBLIN.

To be Held Next Year.

ARRANGEMENTS are now being actively made for the addition of one more—the "Irish International Exhibition"—to the list of International Exhibitions that have been held during recent years. The scene is to be Dublin; and the time, the summer of 1907. The objects are (1) to promote and foster the industries, arts, and science of Ireland by a display of the products for which the country is famous, and of the products of partially developed industries for which special facilities exist in the country; and (2) to stimulate commercial development and to promote industrial education, by inviting all nations to exhibit their products, both in the raw and the finished state. Special prominence will be given to the history, literature, and antiquities of Ireland; while cottage industries and a Women's Industrial Section will be particular features. Promises of substantial support in the shape of exhibits of a varied character have already been received from Great Britain, the Continent of Europe, America, India, and the Colonies; and a valuable loan collection is to be got together for a Fine Art Section. In addition to the more sober side of the Exhibition, there will, of course, be attractions in the way of high-class musical entertainments; and other pleasures of a novel character are also promised.

One of the first steps in the formulation of a scheme of this kind is, of course, the provision of a suitable guarantee; and this is an accomplished fact—nearly a thousand persons, representing all classes of the community, having subscribed to a fund which already exceeds £150,000. Extensive and handsome buildings are being erected in grounds having an area of 52 acres, situated at Herbert Park, Ball's Bridge, in the best residential quarter of the city, and within 1½ miles of its business centre. The site is easy of access so far as visitors are concerned; while it is also convenient from the point of view of exhibitors, as heavy goods can be brought by rail to the immediate neighbourhood. The Marquess of Ormonde, K.P., is the President; and there is a distinguished list of Vice-Presidents, in addition to which the Executive Council contains the names of many other prominent men—so that the project cannot be said to lack really influential support. Then there is a London Committee, the names of the members of which are ample guarantee that the interests of the Exhibition will be ably advanced from this side of the channel. The exhibits will be classified in the following nineteen groups: Irish industries; history and education; fine arts, including photography, engravings, &c.; arts and crafts; liberal arts; manufactures, textiles, and various industries; engineering and shipbuilding; civil engineering and transportation; electricity; motors; gas lighting, heating, and cooking; agricultural implements and chemical industries; agriculture and food products; horticulture and arboriculture; sport and fishing; mining and metallurgy; hygiene; women's section; and cottage industries. Some of the Sectional Committees are now in process of formation, while others have already been nominated. Among the latter is the Works, Lighting, and Machinery Committee; the Chairman of which is Alderman W. F. Cotton, D.L., J.P., and the Vice-Chairman Mr. Robert Booth, J.P., while the Secretary and General Manager of the Alliance and Dublin Gas Company, Mr. Francis T. Cotton, is a member.

It is pointed out that no international exhibition has been held in Ireland for nearly forty years, and that none was ever held in the country of anything like the extent arranged for in the forthcoming display. There have, of course, been many shows elsewhere at which the manufacturers, &c., of the different countries have had opportunities of exhibiting their goods; and it seems only fair that Ireland should have the opportunity, if she chooses to avail herself of it, of enjoying the advantages which the provision of such an attraction may be expected to bring in its train. The country will have a good chance of showing not only of what she is capable, but also what she really is like. A big exhibition means the offering of special facilities for travelling thereto; and special facilities just as certainly mean large numbers of passengers. And of all those who visit the Exhibition, how many will there be who (having once seen the country as it really is, and the Irish as they really are) will not come away with a firm determination to renew the acquaintanceship, on the first favourable opportunity? Surely very few—only those who are unable to appreciate charming scenery and a still more charming people. The only difficulty there can possibly be with Ireland is to get people to go there for the first time. However, we are now considering an effect of the Exhibition, whereas the object of this article is to draw attention to the Exhibition itself, from which much benefit to Irish industry is confidently anticipated. The international character of the project must also be borne in mind; and in this connection we would point out that, as the opening is fixed for May of next year, it is none too early for manufacturers outside Ireland to look into the matter, and obtain such particulars as will enable them to decide whether or not they will show their goods in Dublin. In all probability the prospectus will be issued very shortly; and meantime any information desired will doubtless be obtained on application to the Secretary and Chief Executive Officer, Mr. James Shanks, J.P., Herbert Park, Ball's Bridge, Dublin. We cannot close this preliminary notice without giving expression to our hope that the project may turn out to be an entirely successful one.

PERSONAL.

At the meeting of the Metropolitan Water Board on Friday, a letter was read from the Clerk to the London County Council announcing that Mr. W. C. PARKINSON, who has for some years represented North Islington on the Council, had been appointed a member of the Board in place of one who had resigned. Mr. Parkinson, as our readers are aware, is connected with the firm of Messrs. Parkinson and W. & B. Cowan, Limited.

On Friday, the 9th inst., in the meter-house at the Treforest Gas-Works of the Pontypridd Urban District Council, which had been suitably decorated, Mr. Idris Griffiths (in the unavoidable absence of Mr. Moses Jones, the Chairman of the Gas Committee) presided over a meeting of the employees at the works; the occasion being the presentation of a handsome silver tray, suitably inscribed (subscribed for entirely by the employees) to Mr. and Mrs. EDWARD JONES, on their departure for Burslem, where Mr. Jones will take up the duties of General Manager of the Corporation Gas Department in succession to Mr. Henry Peaty. Mr. J. Jones, the foreman, as the oldest employee, made the presentation, and in doing so, spoke of Mr. Jones's unfailing kindness to the staff and workmen. Eulogistic speeches were made by the Chairman and others, each of whom referred to Mrs. Jones as an ideal lady whose influence had been beneficially felt in the parish of Glyntaff. Mr. Jones responded on behalf of Mrs. Jones and himself, and referred to the cordial relationship which had existed between them and the workmen. He thanked them sincerely for the culmination of their good feeling expressed in their valuable present. A substantial tea had been provided by Mr. and Mrs. Jones, after which a smoking concert gave evidence of the musical abilities of both Manager and employees.

PRESENTATION TO MR. HENRY PEATY.

THE men employed at the Burslem Corporation Gas-Works, numbering from seventy to eighty, assembled at the works last Wednesday evening for the purpose of making a presentation to Mr. Henry Peaty, the Engineer, whose services terminate at the end of the present month. Mr. J. J. Tyson, who presided, alluded in felicitous terms to the remarkably good feeling existing between Mr. Peaty and the workmen, instancing his own case, in which through eighteen years' service no ill-word had passed between them. Mr. G. Walker was then called upon to read the address, as follows:—

To Henry Peaty, Esq.,
Engineer and Manager of the Burslem Corporation Gas-Works.
March, 1906.

Dear Sir,—It is with sincere and deep regret that we, the undermentioned employees of the above works, hear of your impending departure from our midst. Your kindly tact, consideration, and unfailing courtesy, which have characterized your business relations with us, we have always thoroughly appreciated; and we hold in admiration your attainments, qualifications, and business acumen. Forty-three years ago you began work here as a boy, and some thirty-one years have now elapsed since you first undertook the duties and responsibilities of the position you now vacate. During this time much has been accomplished. Step by step, the sale of gas has increased from 60 million cubic feet to 230 million cubic feet per annum. So many alterations and extensions have been planned and carried to a successful issue, fresh departments initiated and organized, modern processes introduced and developed, that but little of the works of thirty-one years ago is now in existence. The works as they stand to-day are a monument of your constructive, administrative, and business abilities.

During the time you have been Manager over us, we can testify to the cordial relations which have ever existed between us; and this has doubtless contributed materially to the successful working of the undertaking. Therefore we herewith beg your acceptance of "The Times" Century Dictionary, Chambers's Encyclopædia, and this illuminated address, as a token of the great esteem and respect that we entertain towards you; and we tender you our hearty good-will and best wishes for a prosperous and successful future, which we hope you, your wife, and family, will long be spared to enjoy.

Mr. T. Newton read a letter from Mr. W. Handcock, sen., to Mr. Peaty, expressing his regret that the state of his health did not allow of his being present at the meeting. He said he was sorry that a connection which had lasted so long, and been so beneficial to the town, was about to be severed. Mr. Peaty had built up works which were second to none for efficiency and stability, and they were capable of meeting for many years every demand likely to be made upon them. Referring to Mr. Peaty's personal qualities, he said: "You have endeared yourself to the men over whom you have been placed for so many years; and I know that there is but one feeling amongst us, and that is deep regret that you are leaving. Our best wishes go with you, and our hope is that you may, in your new sphere, prove as successful and prosperous as you have been in the past. Of your skill and ability we have not a doubt. Personally, I feel the parting keenly, and look back with pleasure on the fact that our friendship of 43 years has been without an unkind word having ever passed between us." Mr. Handcock, jun., having formally made the presentation, Mr. Peaty, in responding, said that no body of workmen would have contributed to the splendid present he had received unless they were in accord in their good wishes. He had been the pioneer of increased wages; for 31 years ago stokers wages were 4s. per day. He so altered the condition that the men were able to earn the same money in six days that they had previously earned in seven. The expenses went up hundreds of pounds that year; but this was more than balanced by £2000 increased receipts—a signal success in his first year of management. He thanked the men most heartily for the present which he assured them would be well used, and handed down with pride to his family. The proceedings closed with musical honours.

THE WATER QUESTION AT DEVONPORT.

WE have received from the Town Clerk of Devonport (Mr. R. J. Fittall) a letter in reference to the article on the above subject, from a local correspondent, which appeared in the "JOURNAL" last week (p. 713). He points out that the conclusions drawn by the writer as to the position of the Corporation in regard to the supply of water to the Government are not justified by the terms of the section of the Act of 1902 bearing upon the matter. In order that their position may be made quite clear, we give the full text of the section of the Act.

21.—(1) Subject to the statutory obligation of the Corporation from time to time, and to the extent only of the powers of the Corporation in relation to the supply of the water hereinafter referred to, the Corporation shall, in addition to the supply provided for by section 20 of the Act 33 Geo. III., cap. 85, provide and sell to the Admiralty, at and for the purposes of any Admiralty establishment, house, residence, or building (including in such purposes a supply for any ships or vessels usually supplied from any such establishments), a continuous supply by measure of water of the same quality and at the same pressure as the water for the time being supplied by the Corporation within the district within which the supply is taken: Provided always that the Corporation shall not be required to supply under this section (except in case of fire) more water in any one day than ninety thousand gallons; and the quantity of water so supplied shall be taken to be the aggregate of the quantities indicated by the several meters through which the water shall from time to time be supplied.

(2) All water supplied under this section in each period of three months as hereinafter defined shall be paid for by the Admiralty at the price from time to time charged by the Corporation to ordinary consumers of water by meter, less a discount off such price calculated at the rate of fifteen per centum.

(3) All sums which shall become payable to the Corporation by the Admiralty for the supply of water under this section shall be paid within twenty-one days after the amount thereof is ascertained; and such amount shall be ascertained on the last day of each period of three months—that is to say, on the twenty-fifth day of March, the twenty-fourth day of June, the twenty-ninth day of September, and the twenty-fifth day of December in each year—and shall be calculated according to the quantity of water actually supplied, as shown by the meters through which the same is supplied since the previous periodical reading of the meters; and for the purposes of this section the meters shall be read for the first time at the end of the day preceding the day on which the Corporation commence to supply water under the provisions of this section, and the next subsequent reading of the meters shall take place on the first recurrence of one of the periodical dates lastly before mentioned.

(4) The Admiralty shall, in addition to all sums payable by them for the water supplied under this section, pay, as and for the rent of the meters, such sum as may represent fifteen per centum on the cost of such meters, and will make such payment by equal quarterly payments within twenty-one days after the end of each period as hereinbefore defined.

(5) It shall be lawful for the Corporation at any time or from time to time to suspend the supply of water provided for by this section, either wholly or in part, if, by reason of insufficiency or a certain and imminent insufficiency of water, or for any reason arising out of, or connected with, or consequent on, insufficiency or a certain and imminent insufficiency of water, they shall not be able, or shall show by a certificate of their water manager (to be verified by statutory declaration, and to be delivered at the office of the Superintending Civil Engineer at His Majesty's Dockyard at Devonport), that within the next forty-eight hours they will not be able to supply water for domestic purposes within their statutory limits of supply to the full extent of their obligations, or by reason of the freezing or obstruction of water in pipes, leats, or conduits, or the bursting of, or other accidents to pipes, leats, conduits, machinery, reservoirs, or other works of any kind whatsoever, or any necessary repairs to, or alterations in, or additions to, such pipes, leats, conduits, machinery, reservoirs, or works, or any of them, or the turning off of water during fire or other emergency, the Corporation shall be temporarily prevented from furnishing the water supply provided by this section. But such suspension or reduction of such supply shall not exceed proportionately the suspension or reduction for the time being reasonably made of the supply for domestic purposes generally.

(6) The Admiralty and the Corporation may, by agreement, vary any of the provisions of this section and of sections 20 and 21 of the Act 33 Geo. III., cap. 85.

Midland Junior Gas Engineering Association.—This Association will hold their annual general meeting on Saturday, the 31st inst. The items on the *agenda* are: To receive the first annual report of the Council; the election of officers for next session; to fill vacancies on the Council; and a paper by Mr. Leslie Wilson entitled "Notes on the Working of Retort-House Governors."

WOODALL-DUCKHAM VERTICAL RETORTS.

Among the patent specifications issued last week was one of more than ordinary interest—being for the modification of the original arrangement of the Woodall-Duckham vertical retort, which was described and illustrated in the "JOURNAL" for July 5, 1904, pp. 26-27. The present patent was applied for, and a complete specification filed, on Oct. 21 last; and this was accepted on the 22nd ult. In view of the fact that, for many months past, much curiosity has been evinced as to what is being done in the matter of carbonizing coal in vertical retorts at Bournemouth, it will be well to give the description of the latest proposals in (practically speaking) the patentees' own words.

They say: In installations of vertical, or substantially vertical, retorts for the destructive distillation of coal—such as that described in specification No. 16,497 of 1903 [that is the one published in the 1904 issue of the "JOURNAL" referred to above], the bottom of the retort is closed by a water-seal, and the coke is removed from the retort by a conveyor which operates in the water. The rate at which the coal to be carbonized is fed into the top of the retort is governed by the rate at which the coke is thus taken away by the conveyor; and the latter rate must obviously not exceed a certain limit—dependent on the speed of carbonization of the coal in the retort. It thus happens that the coke is necessarily submerged in the water for a comparatively long time, and, absorbing more or less water, becomes deteriorated for some purposes. This difficulty is obviously accentuated when a single water-seal and a single conveyor serve several retorts. Moreover, it is difficult to work more than one retort properly with a single conveyor, because the coke is not removed to the same extent from each.

The present invention relates to improvements in installations of vertical retorts of this kind for the carbonization of coal, whereby the conveyor may be operated at any desired speed; so that the coke can be withdrawn from the water-seal before it has absorbed any appreciable quantity of water, and one conveyor may serve for the removal of coke from several retorts.

For this purpose, the charge in the retort is taken up by a suitable support, having a substantially horizontal surface—such as a plate—placed at a short distance below the open bottom of the retort, preferably above the water-line in the water-seal. To facilitate this in the case of a single retort, the extension of the retort which dips beneath the surface of the water is made of greater cross sectional area than that of the retort. In the case of a setting of several retorts, there may be a water-seal common to all, and constituted by an extension of the setting, and within this seal is a separate plate to support the charge of each retort. Across or along a considerable portion of the surface of the plate, or each plate, is caused to move a rake or a pusher at a speed proper to the rate at which the coal is to be fed into the retort or retorts. The length of the stroke is to be such that the pusher forces the coke in front of it over the edge of the plate, and allows it to fall from the retort on to the plate behind it—to be pushed over the other edge of the plate as the pusher returns. In this manner, the removal of a constant amount of coke is ensured at each stroke, without respect to the size or quality of the coke; and so a constant amount of coal is fed into the retort.

The invention is not limited to any particular device for moving the rake or pusher; but it is obvious that the pusher may be conveniently mounted on a rod which passes through the extension of the retort or the setting, and receives a suitable reciprocating movement; and that when several retorts in one setting are in line with each other, as is usually the case, one rod may carry the pusher for the plate belonging to each retort. The coke thus pushed off the plate falls on to the conveyor, which operates in the water below the plates at any desired speed.

In fig. 1 (which is a longitudinal vertical section through a setting of two vertical retorts and the water-seal therefor and a cross section on the line A), the retorts are in the setting the foundations of which form the sides of the water-seal; the ends of the latter being formed of plates K, depending from the setting, and dipping at I into the water in the sump G. Beneath each retort is supported by the foundations a plate D, whose length preferably exceeds the diameter of the retort. Through stuffing-boxes F on the end plates of the water-seal extends a hollow rod E, made up of three lengths joined together by hollow cylindrical pushers C. Water is circulated through this rod and the pushers; and the rod is given a reciprocating movement (by suitable mechanism) to cause the pushers to travel to and fro on the surface of the plates D respectively, represented by the distance between C and C^1, at a speed corresponding with the desired rate of carbonization of the coal in the retort. The coke thus pushed from each plate falls into the conveyor H, which operates beneath the surface of the water in the sump at any desired rate.

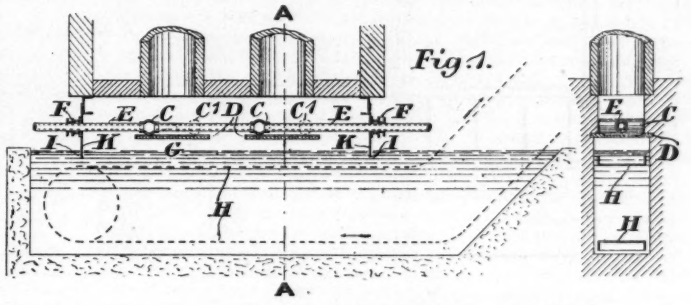


Fig. 1.

Fig. 2 shows an arrangement of six retorts; the cross section being on the line B. Here the retorts are in two rows of three each; and for each row there is a rod E operated by a ram O and carrying three pushers C, one for each plate D. These plates are supported by girders M, which also support webs N of plates L that form a hopper for directing the coke on to the conveyor H. In this case, the upper stretch of the conveyor is not immersed in the water except where it dips beneath the plate K; so that the coke is immersed in the water only for a very short time. As the conveyor removes the coke much faster than it is dislodged from the plates by the pushers, the hopper made up of the plates never becomes full, and the coke never gets jambed therein. The pushers are perforated, to permit the water passed into the hollow rod E to issue in sprays for cooling the plates.

The patentees claim: 1. In combination with a continuously working vertical retort which has its lower end water-sealed, and has a device whereby the coal is fed at a rate governed by the rate at which the coke is removed, a support, having a substantially horizontal surface, beneath the lower end of the retort, preferably above the water-line of the water-seal, and a rake or pusher arranged to travel to and fro along the surface for such a distance that a constant amount of coke is discharged at each stroke, and so a constant amount of coal is fed into the retort. 2. In a combination such as is referred to in claim 1, cooling the rake or pusher by allowing water to flow through it. 3 and 4. Apparatus for removing coke from vertical retorts constructed and operating substantially as described and illustrated.

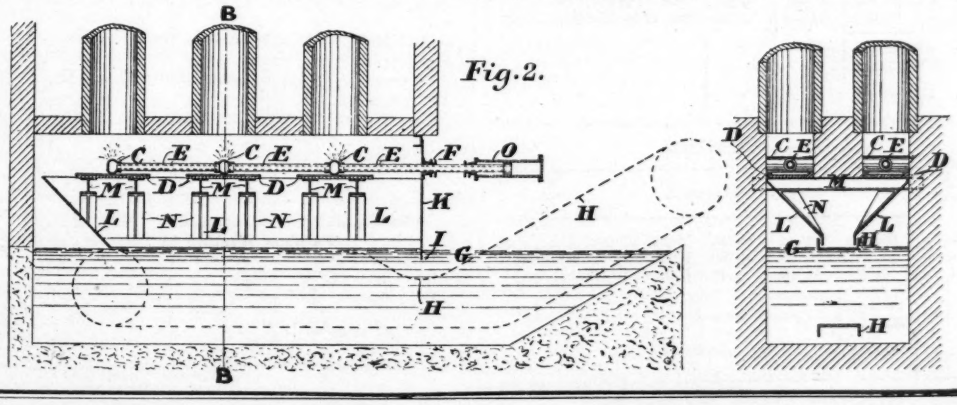


Fig. 2.

Professor Lewes on Fire, Fire Risks, and Fire Extinction.—At the Society of Arts last night, Professor Lewes delivered the second of a series of four Cantor Lectures on the above subject, the first of which was briefly noticed in the "JOURNAL" for the 13th inst. In that lecture, it may be remembered, he dealt with the science and the causes of fire. Last night he discoursed on the risks attending it; referring specially to the dangers of the ordinary methods of lighting—by candles, mineral oil-lamps, and gas. The lecture was specially interesting to our readers, and we hope to notice it at greater length next week. In the third lecture, to be delivered on the 26th inst., Professor Lewes will treat, among other things, on the spontaneous ignition of material in bulk—such as coal, charcoal, and waste—and also on dust and dust explosions as causes of fire.

NOTES ON PURIFICATION.

By W. Hill, of Stalybridge.

Adverting to the recent discussions on purifying results, I send you a brief account of some which have been obtained at the Stalybridge Gas-Works.

The purifiers there are four in number, each 30 ft. by 20 ft. and 5 feet deep; and the maximum daily make is 750,000 cubic feet. To find the constant: $30 \times 20 = 600 \div 750 = 0{\cdot}8$. Drawing No. 1 gives a general description of our method of elevating and conveying. The apparatus is a combined arrangement of a brake-hoist and racking or travelling motion. It has now been working for 3½ years, and the only repairs have been tightening the chains, belts, and driving-ropes. The oxide is emptied through shoots at the bottom of the purifiers into a self-tipping bracket on a carriage (holding about 7 cwt. of oxide). It is then allowed to stand in bulk for some time, if it does not show signs that may lead to the firing of the oxide. It is then spread on the floor to a depth of 12 to 15 inches, and again allowed to stand for several days, after which it is turned over twice, with an interval between each turnover, and is then ready for use. My reason for stating the foregoing is to show how the results given below have been obtained.

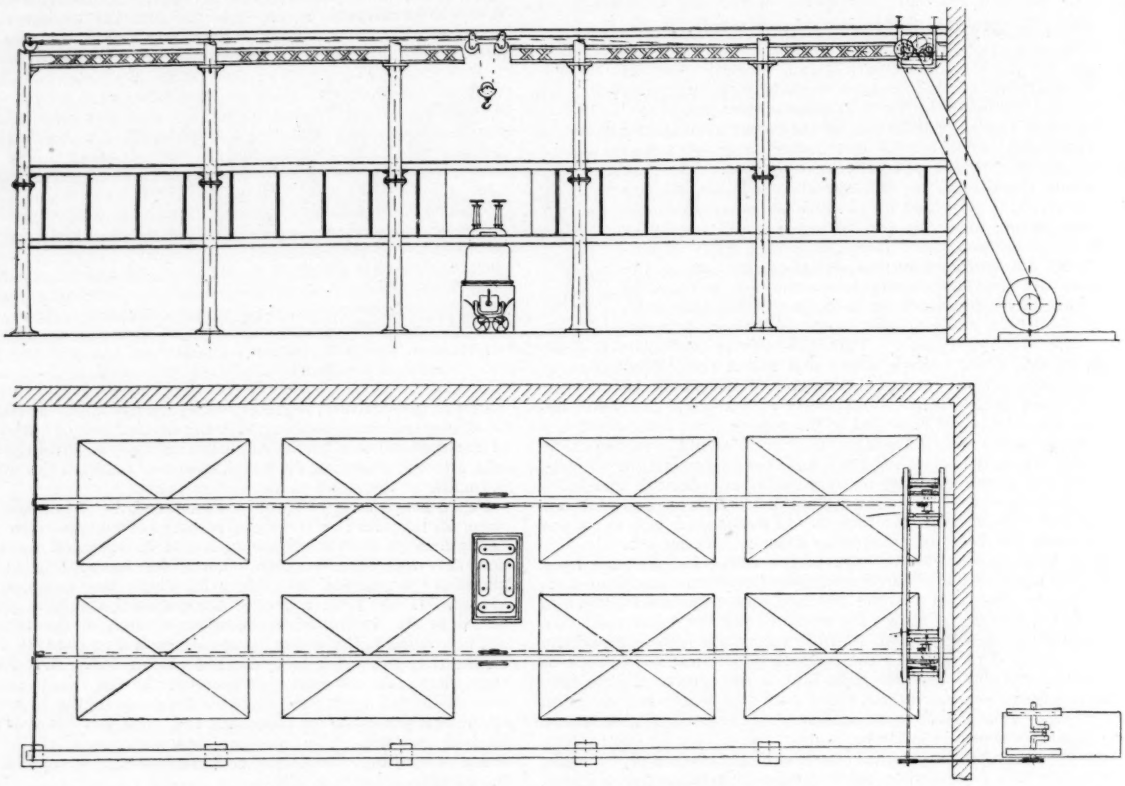


Fig. 1.—The Arrangement of Purifiers at the Stalybridge Gas-Works.

Table I.—*Artificial Oxide.*

Turns in Box.	Sample A. Gas Purified in Thousands of Cubic Feet.	Percentage of Sulphur in Bulk.	Percentage of Moisture in Bulk.	Time Extended.
1	75,645	30·30	17·00	Jan. 23 to Aug. 31, 1904
2	36,992	41·87	9·58	Sept. 24 to Dec. 15, ,,
3	39,684	51·80	4·10	Jan. 12 to March 22, 1905
Total	152,321			
Average	50,773			

Table II.—*Natural Oxide.*

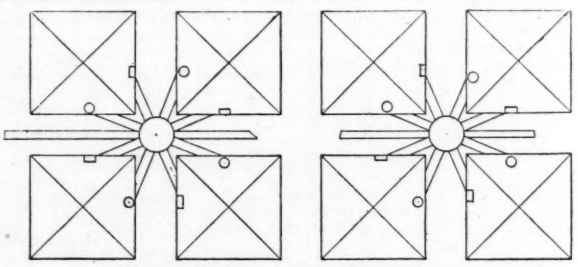
	Sample B.			
1	66,315	21·54	20·06	March 26 to Oct. 24, 1904
2	37,286	26·60	15·60	Nov. 12, '04, to Jan. 4, '05
3	77,638	51·00	3·00	Jan. 20 to July 20, 1905
Total	181,239			
Average	60,413			

Table III.—*Three Samples, One Turn Each.*

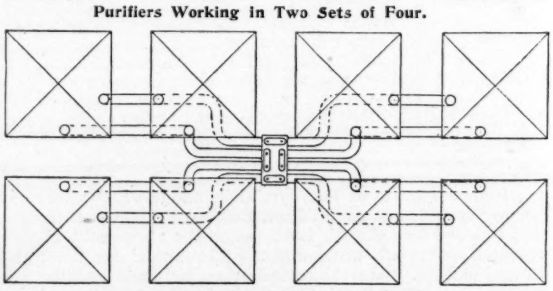
Natural oxide	30,290	15·90	21·80	Sept. 11 to Nov. 15, 1905
Artificial ,,	40,173	19 65	18·30	Oct. 5 to Dec. 19, ,,
,, ,,	39,227	19 26	17·19	Oct. 24 to Dec. 28, ,,

The labour expended on the two samples A and B, and the emptying and refilling of the purifiers, was the same. The figures are as follows.

Cost of 45 Tons Unloaded.	Wages Paid for Emptying and Refilling Boxes.	Wages Paid for Revivifying.	Total.
I.—£50 17 0	£6 0 0	£3 15 0	£60 12 0
II.—£53 2 0	6 0 0	3 15 0	62 17 0



Purifiers Working in Two Sets of Four.



Purifiers Working in One Set of Four.

FIG. 2.

In the course of the discussion on Mr. Kendrick's paper at the recent meeting of the Manchester District Institution of Gas Engineers, he made a statement to the effect that our purifying area was 50 per cent. larger than that at Stretford. I cannot tell how he arrived at these figures, because if he worked all the available purifying area in one set of four instead of two sets of four, as shown in Drawing No. 2, the constant is very little less than that for Stalybridge.

Stalybridge . . . 30 × 20 = 600 ÷ 750 = 0·800 constant
Stretford . . . . 40 × 20 = 800 ÷ 1100 = 0·727 ,,

If I take Mr. Kendrick's own figures, that our make is three-fourths that of Stretford, the constant is exactly the same, 0·8.

SOME NOTES ON ACETYLENE.

By F. H. Leeds, F.I.C.

Two matters have arisen in connection with the British acetylene industry during the past few months, which appear to have sufficient technical importance to deserve some little consideration. The first of these relates to the compression of a mixture of acetylene and oil gas, as brought into prominence by a Home Office Order issued last winter; the second is the question as to the advisability of allowing alloyed copper to come into contact with acetylene, which culminated when the last new rules of the London County Council about the employment of "dissolved acetylene" for cinematograph entertainments in theatres and the like, were published a few weeks ago.

Acetylene-Oil-Gas.

The original Home Office Order regulating the preparation and use of acetylene-oil-gas bears the date of March 28, 1898; and its essential provisions are that a mixture containing not more than 20 per cent. by volume of acetylene may be compressed to a limit not exceeding 150 lbs. per square inch. The new Order—published in the middle of November last, dated Sept. 29, 1905, and signed by Mr. Akers-Douglas, the late Home Secretary—stipulates that if the acetylene is generated by the "Atkins Dry Process" a mixture containing not exceeding 50 per cent. by volume of such acetylene may also be raised to a pressure not exceeding 150 lbs. per square inch. To be precise and worthy of a legal enactment of this nature, the temperature at which the pressure must not exceed the prescribed point ought to be mentioned; but this has not been attended to.

In order to consider the relative propriety of these directions, some of the physico-chemical properties of acetylene have to be studied. Being an endothermic compound, there is a kind of critical pressure at which acetylene stored in the absence of air loses its natural degree of stability. Below that pressure, a spark produced by friction or electricity, or a severe shock applied to the interior of the vessel holding it, produces no more than a purely local dissociation into its elements; the extent of the decomposition being so circumscribed as to be of no practical importance whatever. Above the critical pressure named, however, a spark, shock, or a suitable heating of the vessel, causes the whole bulk of gas present to dissociate violently; and the decomposition proceeds with the accelerating velocity which characterizes an explosion. According to the experiments of Berthelot and of Dupré in this country, the so-called critical pressure lies at a point which, at ordinary temperatures, is sensibly that of two atmospheres absolute. Hence the maximum effective pressure set up during the preparation or use of neat acetylene, is always regulated by law or otherwise to some figure appreciably less than that of one atmosphere; the only exception being when the gas is compressed by its manufacturer, without loss of time, into acetone held within the interstices of an appropriate porous material ("dissolved acetylene").

Thus it may be said that the maximum degree to which acetylene when uncontaminated with air or other impurities, and not diluted with any other gas, may be safely compressed is one lying somewhat lower than a "partial pressure" of two atmospheres absolute. It follows, therefore, that if the acetylene is first diluted with some gas which is wholly indifferent to it, and neither increasing nor diminishing the natural tendency of the acetylene to dissociate—some gas which is (obviously) stable of itself at the pressure contemplated—the mixture of acetylene with the other gas may be safely raised to a pressure, at ordinary temperatures, at which the acetylene in the mixture stands just below a partial pressure of two atmospheres absolute. This state of affairs was calculated upon in the earlier Home Office Order quoted above; for it is needless to say that the acetylene in a mixture containing 20 per cent. by volume of that constituent exists at a partial pressure of two atmospheres when the whole mixture is raised to a pressure equal to 150 lbs. per square inch. Now, it is highly probable that no such ideally indifferent diluent gas exists, but that if the gas with which the acetylene is diluted does not increase the tendency of the latter to dissociate, it diminishes the tendency. Therefore, if a mixture of acetylene with a suitably sluggish or indifferent gas is prepared, the mixture is not likely to be capable of dissociation (even so far as the acetylene in it is concerned) under the influence of a spark or shock until the whole is so highly compressed that the acetylene stands at a partial pressure appreciably exceeding that of two atmospheres absolute. On these lines, we may say with some measure of assurance that the first Order was rather too severe; or better, perhaps, that it is too severe now that acetylene is generated in a better fashion, and purified more seriously, than in the days of 1898. Whether acetylene of suitable purity diluted with oil gas may be safely raised to such a pressure that the acetylene exists at a partial pressure of five atmospheres—as implicitly prescribed in the Order of September last—is a question that only experiment can solve.

After having wrapped themselves in secrecy for several years, the proprietors of the Atkins dry process of generating acetylene —*i.e.*, the Sun Gas Company of Westminster—have at last suffered a technical description of the plant, and the experiments carried out with it, to appear in a contemporary. The Home Office Order seems to have been granted in consequence of certain tests now made public. A half-foot cylinder was charged to a pressure of 200 lbs. per square inch with a mixture in equal volumes of acetylene and oil gas, and an electric current was passed through a short piece of platinum round which some gun-cotton was wrapped. After running off the gas, it was found that the gun-cotton had burnt, and the platinum wire had "deflagrated" (whatever that may mean), but that no carbon had been produced by the dissociation of the acetylene. The test was repeated under the same or slightly different conditions, with the same favourable result; and therefore it does seem to be established that acetylene of sufficient purity will bear in perfect safety a partial pressure of 75 lbs. (*plus* 25 lbs. as a working margin) when oil gas is the diluent.

It would be foreign to my present purpose to describe fully the Atkins apparatus, or to discuss the general aspect of this method of generating acetylene from calcium carbide. Indeed, before one could do so fully, much more information must be vouchsafed than is at present available. The point of more immediate interest is that Atkins acetylene apparently without any chemical purification, has been examined by a Westminster analyst, and found to contain 0·082 milligramme of phosphorus per litre, 0·010 milligramme of sulphur, and 0·366 milligramme of ammonia. These figures represent a sufficient degree of purity for all practical purposes—except the ammonia perhaps, and indicate a gas that would in all probability pass a properly applied Keppeler test-paper. If such a degree of purity were to be constantly maintained, the acetylene would behave well under an incandescent mantle, always provided that no dust were carried forward from the agitating drum. The report asserts that the phosphorous compounds resulting from the decomposition of phosphides in the carbide are retained by the sodium in the form of "sodic phosphite"—a statement of which I should like some confirmation. The purity of any particular sample of acetylene depends not only on the method of generating it, and on the method (if any) of chemical purification, but manifestly on the quality of the carbide decomposed. In this connection it is interesting to remember that the Sun Gas Company have announced their acquisition of a particular carbide factory.

The objection to the Home Office Order of Sept. 29 last—a somewhat serious blemish—is to be found in the way it has been issued. On former occasions the British Home Office has always acted in a most friendly and judicious spirit towards the acetylene industry, and members of the trade owe much to the officials of the Explosives Department (although some might wish to contest that statement). Now, however, an Order has been drafted in a way that must lead the non-technical public to believe that the "Atkins Dry Process" of generating acetylene is something vastly superior in the quality of its product to that which can be prepared by any of its competitors, on the ground that it has been accorded a privilege withheld from them. Actually, the Order is not of great importance—partly because the field for compressed acetylene oil gas is sharply defined, but chiefly because it has already been officially announced that "it is open to anyone to show by actual experiment that acetylene when manufactured by any other process than the 'Atkins' is equally free from liability to explosion under the conditions named in the Order. . . . But until this is done, the Secretary of State cannot see his way to make the Order more general." [Letter to the Acetylene Association, dated Jan. 18, 1906.] At the moment, I believe that no representative of the branch of the industry which is interested in train or vehicular lighting (for that is what the whole matter really relates to) has found it necessary, or even advantageous, to apply for a further Order; and therefore it scarcely falls within one's province to complain. Nevertheless, it is unfortunate that a document should have been published by a Government department lending itself so freely to purposes of advertisement, when it should have been drawn up in such fashion as merely to stipulate for a certain degree of purity in the acetylene (however generated) that is to be mixed with an equal volume of oil gas, and then compressed to 150 lbs. per square inch.

Acetylene and Alloyed Copper.

Up to a short time ago, the London County Council prohibited the use of acetylene in the lanterns employed in giving cinematograph entertainments in the theatres and music-halls under its control. But a few weeks since, this rule was modified; so that the lanterns can now be supplied with acetylene, provided the gas comes from a cylinder of dissolved acetylene, and that no alloyed copper finds a place about the plant. This again is a matter of not very great direct interest to the trade or to the general public, for the regulation only affects those persons who build or use cinematograph apparatus, and the firm exploiting

the dissolved acetylene process in this country. To the latter, the rule in question is not particularly troublesome, since steel valves can without any difficulty be fitted to the cylinders, instead of gun-metal ones. Nevertheless, the regulation is likely to be manipulated for commercial purposes into an official pronouncement that it is dangerous to have even alloyed copper in or about acetylene apparatus of any kind.

Everybody concerned in the acetylene industry might be supposed to have a reasonably clear notion as to the risk involved in allowing acetylene to come into contact with copper itself. When the gas is warm, moist, and charged in the natural way with impurities—especially ammonia—it is liable to react with unalloyed copper, yielding a body known as copper acetylide, which is sharply explosive when dry. Conclusive evidence that a similar reaction cannot take place when the acetylene is pure has not yet been offered, although there is much probability in the assumption that a reaction between metallic copper and pure acefylene, with copper acetylide as the product, is somewhat unlikely to occur. Hence the employment of unalloyed copper in the construction of acetylene plant is prohibited by law, practically forbidden by fire insurance officials, or condemned by the different Acetylene Associations—as the case may be. The new Government code of rules which came into force in Austria in February, 1905, says "parts that come into contact with carbide or acetylene must not be constructed of metals (especially copper) which form explosive compounds with the gas. Copper alloys, such as brass, bronze, and the like, may be used for cocks, valves, screw connections, and similar parts; and these must always be kept clean." In the analogous general code which came into operation in most parts of Germany at the beginning of last October or soon afterwards, the corresponding rule reads "Copper must not be used in the construction of any part of the apparatus or service-pipes. The employment of brass is permissible." There is a virtually identical rule in the suggestive code of our Acetylene Association. The rules of the German Association specify that apparatus shall only be constructed of wrought or cast iron; that unions, cocks, and valves shall not be made of copper; but that the use of brass and bronze is permitted. Thus the general trend of expert opinion is that there is no objection to having alloyed copper in or about acetylene plant.

All this is elementary, and ancient history. It would not be mentioned but for two circumstances. Only a few weeks ago a firm of motor-car builders or repairers wrote to one of the leading automobile journals describing (with some surprise apparently) a series of small explosions they had experienced when cleaning out a "copper" pipe employed to convey acetylene to the lamps of a car. The pipe was choked "with a hard, black substance like coal," which flew out to a distance of 12 or 14 feet when attempts were made to "melt" it with a blow-pipe. This seems to show that some acetylene lamp makers or erectors are still employing unalloyed copper in a manner that may be dangerous, and must be harmful to the development of the industry. The second circumstance is that last winter a motor-cyclist asserted that he had experienced an explosion when rubbing a deposit off a part of his acetylene lamp made of "brass." It has already been suggested in print that the "brass" in question was really iron coated with copper and afterwards nickelled, the nickel having flaked off in places, leaving the copper bare. Information has, in fact, been given to the writer to the effect that iron nickelled on copper is, or was, used in the construction of vehicular lamps by certain builders—a practice which has now apparently been proved to have the objectionable aspect that might easily have been prophesied.

Returning, now, to the new rule of the London County Council, it will be seen that there is less reason for prohibiting the use of alloyed copper in cinematograph plant, when the acetylene is "dissolved," than in vehicular generators where the gas is crude. Before the reducing valve on the cylinder itself, a much higher pressure prevails than can be found in a generating-lamp; and here, therefore, the avoidance of alloyed copper may be urged as desirable. After the valve, on the contrary, there is no real reason at all for forbidding the use of brass or bronze, whether the cylinder of dissolved gas is to feed the lamps of a motor-car or the lanterns of a Metropolitan house of entertainment.

One will not be far wrong in giving the following as the explanation of this new restriction. The oxy-acetylene blow-pipe, which has already proved very useful for the autogenous soldering of iron and copper, is primarily a French invention; and its original form was that of the "high-pressure" blow-pipe, where both the acetylene and the oxygen had to be supplied to it under much pressure. One way of providing for a supply of gas under pressure was to use a cylinder of dissolved gas; but another was to modify a generator of the usual kind so that the pressure given by it should be sufficient. After this second plan was proposed, the question arose (in France) whether a high-pressure generator of the kind required might exhibit any dangers; and consequently the Conseil d'Hygiène de la Seine appointed a Committee, consisting of MM. Moissan, Vieille, Linder, and Adam, to study and report. During the year 1904, they handed in an opinion to the effect that any generator evolving acetylene at a pressure exceeding 59 inches of water column (but below that of a higher figure) must be so constructed that no copper—even in the alloyed condition—should appear in or about the plant and gas-pipes. The recommendation was most probably quite judicious under the prevailing circumstances; but clearly those circumstances are not identical with the conditions obtaining in the employment of acetylene for optical lantern work, where no such pressure exists after the main reducing valve on the cylinder. Nevertheless, the regulations made by the French Committee were adopted *en bloc* by the officials of the London County Council, whose advisers apparently were unable to see the difference between the two processes in view. It is not intended to put the blame for this misunderstanding on the shoulders of any particular person; all that need be pointed out is the absence of any real necessity for prohibiting the employment of alloyed copper in ordinary forms of acetylene apparatus, while emphasizing the desirability of avoiding the use of that metal in the unalloyed state. Numberless cylinders of dissolved acetylene in which the accessories—such as the reducing valve, high and low pressure gauges, the stop valve, unions, and connectors—are composed of some alloy like gun-metal have been in use for several years, and are so still, in France, the United States, this country, and Austria; and no accident has yet occurred in connection with them. The writer has experimented with one of these cylinders for months, carrying out numerous photometric observations upon the behaviour of incandescent acetylene burners with the aid of dissolved acetylene (on the results of which investigation he hopes to be able to report shortly); and on no single occasion has he experienced the least accident or mishap, or found the cylinder to fail in its delivery of gas with the utmost smoothness desirable.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to the New University, Birmingham.

On Saturday afternoon, about forty members of the Association assembled at the New University, Birmingham, when, by kind invitation of the Principal, a visit of inspection took place; Mr. R. C. Porter, the Lecturer on Engineering, acting as conductor to the party.

The main buildings of the University consist of four blocks radiating out from a circular corridor, like the spokes of a wheel, from the nave. These four blocks are named A, B, C, and the Great Hall. The latter is only half built at present, but will eventually contain the kitchens, restaurant, common rooms, &c., in addition to the Great Hall itself, which will be used on state occasions only. Block A contains the drawing office on the upper floor, and the machine shop and pattern shop on the lower floor; Block B contains the electrical laboratories and the civil engineering department; and Block C contains the mining and metallurgical departments. The lecture theatres are not finished yet, but will be on the other, or inner, side of the circular corridor. The foundry, smithy, and steel melting shop are in separate buildings. The Great Hall, being in course of construction, proved most interesting and instructive. The completed portions of the main building are replete with machinery of every kind and description; but unfortunately time prevented a through inspection of it. The power station is some distance from the main building, and contains a most varied assortment of boilers, steam-engines and turbines, and electric motors and dynamos; the dissimilarity being, of course, for instructional purposes. There is a large gas-engine, of special design, to be used by Professor Burstall in connection with his forthcoming experiments. The engine is fitted with Professor Lodge's sparking arrangement, whereby the attendant can see that the spark occurs. There is a Mond gas plant arranged near the power station; the gas being used for heating furnaces in the main building and melting brass in the foundry, as well as for power purposes.

In the absence, through illness, of Mr. F. J. Bywater (the President), Mr. G. W. G. Tatam (the Senior Vice-President) proposed, and Mr. James Hewett (the Hon. Secretary and Treasury) seconded, a vote of thanks to the Principal and Mr. Porter for the most interesting and comprehensive insight which the members had been given into the apparatus provided in connection with the new Chair of Engineering.

Obituary.—We regret to have to-day to record the death on Saturday, at his rooms at Whitehall Court, of Mr. Joseph Aird, of the Wellington Tube-Works, Great Bridge, Staffordshire. The deceased had been unwell for some time with cardiac trouble. He was a younger brother of Sir John Aird, and was well known to the gas profession, having been elected an extraordinary member of the British Association of Gas Managers on the occasion of the meeting of that body in London in 1872; and his name was on the roll of the Gas Institute until the union with the Institution of Gas Engineers in 1903.—Last Wednesday, the death occurred, from heart failure, of Alderman William Watkins, J.P., the Chairman of the Cray Water-Works Committee of the Swansea Corporation. Deceased had been attending an unusually long meeting of the Council in committee, and had to hurry in order to catch a train for Pontardulais to fulfil an engagement. On reaching that place he was seized with illness, which unhappily proved fatal. Alderman Watkins entered the Council in 1897, and two years later was elected Mayor. Deceased was in his 74th year.

AIR GAS.

By F. R. E. Branston.

As the demand for small gas installations increases for lighting, cooking, and warming purposes, it is interesting to note the advances made in various methods adopted for the purpose, and how each one has peculiar advantages of its own, which cannot be obtained in an equally satisfactory manner by the others. For the manufacturers of apparatus for one particular system to ignore what is taking place in other directions, and to shut their eyes to the improvements and advantages offered by their competitors, is to live in an atmosphere of false security, some day to wake up and find that it is impossible for them to compete with their rivals. Electricity is convenient in many ways, but expensive for lighting, and more so for cooking and warming, in comparison with other systems; acetylene holds its own well for lighting motor-cars and bicycles, and is a good substitute for the ordinary coal-gas light, as produced with flat-flame burners; while air gas cannot be used for lighting by means of flat-flame burners, but is suitable for cooking and warming purposes, and, with incandescent mantles, gives excellent results for lighting. For purposes where gas is required under pressure, a properly made oil gas will be found superior to all others, and merits more attention than is at present bestowed upon it.

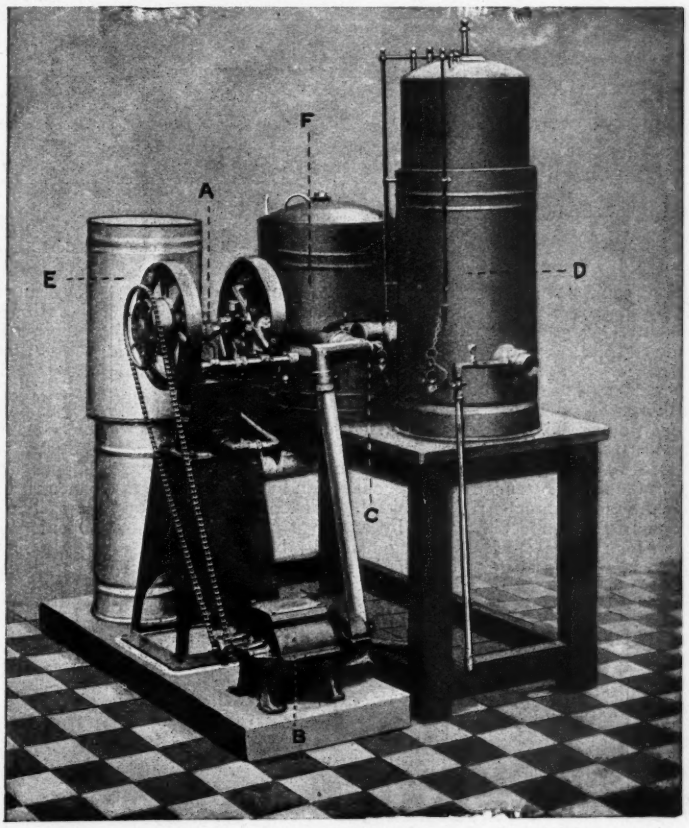
It is evident that the system that produces a gas for domestic purposes in the most economical manner, which is simple to work, and safe in use, must make considerable headway in gaining popularity, provided the working results are satisfactory, and the plant is well constructed and lasting—as a breakdown of any kind is liable to cause serious inconvenience. In fact, in any case it is well, in all small plants for the production of any kind of gas, that duplicate plants should be installed. Air gas has been in use for some time in the United States of America; but none of the plants that have come under my notice seem quite satisfactory in many of the principal points of their manufacture, and it seems to have been left to the engineers of this country to construct what may be described as a really reliable plant for the production of air gas.

In the "Journal" for July 12, 1904, a description was given of an arrangement which was then being placed on the market by the Economic Safety Gas Company, Limited, which was formed with the object of exploiting certain patents that were then described. Reference was made to a report on the gas, by Professor Vivian B. Lewes and Dr. Boverton Redwood; and in a lecture delivered some time back at the Society of Arts by Professor Lewes, he stated that he had examined, in conjunction with Dr. Redwood, a process for mixing air with gas at a distance from the burner, the air being only carburetted to the point at which it gives a non-luminous flame—that is, nearly the whole of the air needed for the combustion of the petroleum vapour is mixed with it before combustion; and this mixture is then consumed in burners of special construction, which eliminate any risk of flashing-back. The result is that a great gain in illuminating value is obtained; and Professor Lewes stated that "this process promises results of the highest importance." An air gas made from ordinary petrol, containing only 1·52 per cent. of hydrocarbons to 98·48 per cent. of air, forms a non-explosive mixture; and, although it has no smell, there is no danger from escapes. Then, as the air required for combustion is mixed with the hydrocarbons before it enters the pipes, very little, if any, of the oxygen from the surrounding air is consumed by the special burner which produces the light with an incandescent mantle. In this manner a light of about 800 to 900 candle power can be produced at a cost of 1d. This is considerably more than can be got from coal gas at ordinary pressure with upright incandescent burners, but about the same as is realized by the best inverted incandescent burners, according to the latest tests made by the highest authorities in Paris. It still, therefore, remains to be seen what can be done with air gas and inverted incandescent burners, which may yet produce some startling results.

A great point which may be claimed in favour of air gas is its extreme cleanliness, as not only is the flame perfectly free from smoke and will not injure decorations, but it is clean in manufacture, and leaves no deposit in the pipes so long as the proper temperature is maintained. As in all other installations for gas production, it is best to have the plant set up in an outhouse; but being very simple and small, a complete plant for a hundred lights will cover only a few square feet of floor-space.

The illustration shows a plant which I have lately examined, and which, besides being well and substantially constructed, seems to combine improvements of very considerable importance. It is simple and self-contained, and consists of a hot-air motor A, which is driven by gas produced by the apparatus, and drives the blower B, which supplies the necessary current of air to the carburettor C and to the auxiliary air supply. The weak gas that is thus made passes into the small holder D, and thence to the various burners. E is the cooling tank for the engine; and F the petrol container. The whole apparatus, being automatic, produces the exact amount of gas required according to the number of burners in use. The quantity of petroleum vapour existing in the air in a given space depends on the temperature; it then unites mechanically, and finds it way among all the particles of the air so as to fully saturate them. The air then being kept apart from the gaseous mixture and delivered at a suitable temperature before reaching the limit of saturation, the tension or elasticity remains the same, so long as the temperature is kept up. This can be done as long as there is no chemical affinity between the air and vapour, as the expansive force is maintained in dry air so long as there is an equal temperature.

In the manufacture of apparatus for the purpose of generating air gas, it is important to take into consideration the electro-chemical action which is liable to be set up, as without this no satisfaction can be obtained. This is by no means generally found to be the case; but in the plant now under notice these points have received careful attention, with a result which will be found in working to make it the most satisfactory apparatus of the kind which has yet been supplied for the purpose.



If air gas can be made and delivered dry, at normal temperature, which can be kept up, having other advantages of undoubted value, there is no reason why it should not become the most economical method for obtaining both light and heat for isolated places, and for domestic establishments in places where coal gas is not manufactured on a large scale. It has so many points in its favour that it deserves patronage in proportion.

According to the report of the Council of the Institution of Mechanical Engineers, which was presented at the 59th Annual General Meeting of the members, the number on the roll of the Institution at the end of 1905 was 4750, compared with 4477 at the close of the previous year; showing a gain of 273. The Institution lost by death Mr. Charles Horsley and Mr. James Mansergh; the latter having been on the Council since 1902. The total revenue for the past year amounted to £12,713, while the expenditure was £11,093. The gas-engine research, in connection with the two specially constructed large engines at the University of Birmingham, is being carried on by Professor F. W. Burstall. The Council state that the effect of changing the compression, other things being constant, is now being investigated. Special arrangements have been found necessary for dealing with the high compression; and the presentation of the next report is therefore not expected during the current year. It is also intended to investigate the law governing the change of gas temperatures at various points within the cylinder. Sir Alexander B. W. Kennedy, LL.D., F.R.S., is the Chairman of the Committee.

AN INTERESTING COAL STORAGE PLANT.

As the storage and handling of coal is a subject in which managers of gas-works—particularly those of large size—are specially interested, we reproduce, from a recent number of the "Engineering Review," by permission of the Editor, who has obligingly lent the accompanying blocks,* some particulars of an installation of plant which the Dodge Coal Storage Company of Philadelphia have put up at the Shadyside (New Jersey) Station of the New York Edison Company. It is shown in elevation and plan in figs. 1 and 2; and it provides for a reserve supply of 100,000 tons of anthracite and 50,000 tons of bituminous coal, which may be drawn upon in case of emergency. On account of the fact that the large new waterside station of the Edison Company in New York consumes, on the average, 1000 tons of coal per day, and that the total coal-bunker supply at the station would not hold out for more than about ten days if all further sources were cut off, the importance of the plant will be evident. Owing to the lack of available space in close proximity to the station, the plant was located at Shadyside, on the Hudson River. A frontage of 460 feet, and a depth of 1500 feet, were secured on the river, and at the water front a dock 20 feet in width was installed to carry the high-speed hoisting tower and bridge tramway for handling to and from boats. Two anthracite piles of 50,000 tons each have available space in the yards; and adjacent to the dock there is a 50,000 ton bituminous pile. The rear of the site is occupied by storehouses; and there is room for an additional anthracite pile if needed. This coal is handled by Dodge trimmers for piling, and by a Dodge radial pivotal reloader for removal; delivery being made by belt conveyers to the dock, where a steeple tower is installed for the loading and unloading of boats. The bituminous coal is stored in a rectangular pile; its conveyance to and fro being effected by a traversing bridge tramway which spans the pile.

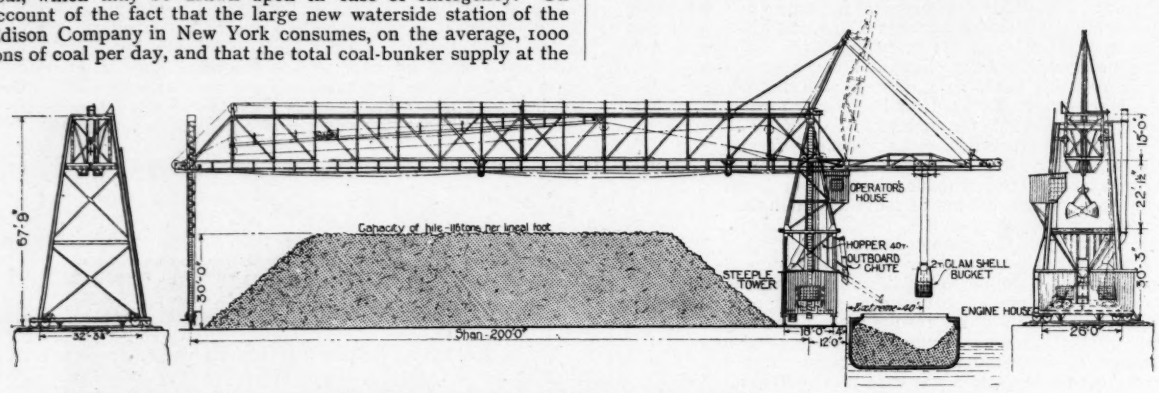


Fig. 1.—Elevation of Edison Coal Storage Plant.

The illustrations show the construction of the traversing bridge for the bituminous coal pile. A bridge is provided for carrying the trolly for cross movements of the coal-bucket, and has a span of 200 feet between centres of support; the clear height under the trolley runway being sufficient to permit of handling the bucket over a 30 feet pile of coal. The bridge is supported at the dock end by a tower 67 feet in height, which carries in the housing at its base the boiler and engines to operate the hoists, &c.

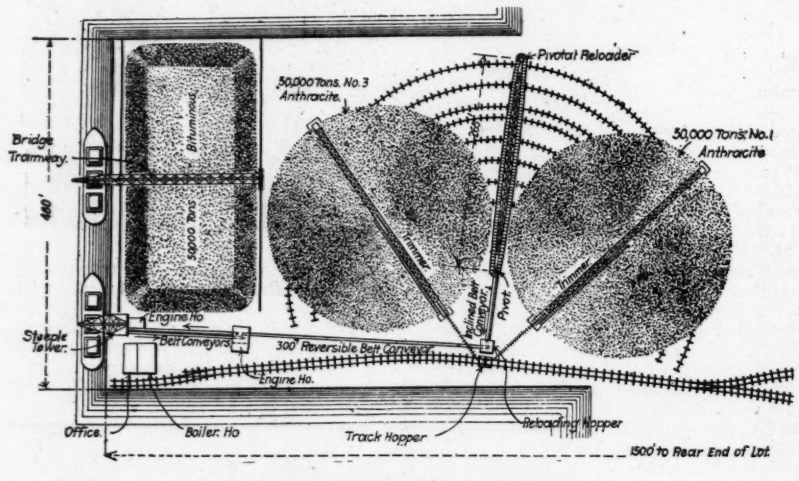


Fig. 2.—Plan of Edison Coal Storage Plant.

The structure is carried on three lines of rails, extending over 400 feet along the line of the dock, so as to cover all parts of the pile. In moving, it is operated by its own power.

A 2-ton bucket, which travels on a runway connecting with a boom projecting over the water, handles the coal in unloading from the boats (fig. 5). The boom is of sufficient length to permit the bucket to be extended out 40 feet beyond the dock line; and it may be lifted to a vertical position to permit of masted vessels passing when docking. For loading the vessels, the bucket discharges into a 40-ton steel hopper above the engine housing, from which a swivelling outboard shoot is hung for delivering and trimming. Two standard engines are used for the operation of the bucket—one for the closing and hoisting, and the other for the trolly traverse. The former has 12 in. by 12 in., and the latter 10 in. by 12 in., cylinders. Steam is supplied to these engines by a 5 ft. by 12 ft. vertical tubular boiler, also carried in the tower.

The anthracite-handling plant is designed for receiving either by boat or rail, but the bituminous coal is arranged for handling only by boat. It is dumped from cars directly into a track hopper, from which the trimmers distribute it to the circular piles when received by rail. The trimmers are of the standard type of inclined truss, with scraper conveyor leading up one side. Openings in the scraper trough permit the coal to be dumped at any point on the pile desired. When the coal is received by boat, it is handled by a steeple tower at the dock, which, by means of a 1½-ton bucket lifts the coal on to a belt conveyor system. This extends back, and delivers into the track hopper near the anthracite piles which feed the trimmers as when received by rail.

A steeple tower is located on the docks permanently, and has a total height of 90 feet, while the overhanging boom permits of an extreme position of the bucket 30 feet beyond the dock line. The trolley runway extends back over a 40-ton hopper in the upper part of the tower, below which are two weighing-hoppers, and still below these a discharging-hopper for delivering the coal received to the belt conveyor leading back to the trimmers. The 40-ton hopper into which the bucket dumps has sufficient capacity to keep the weighing process continuously in operation when unloading from a boat. The weighing is accomplished by keeping the two hoppers, which are each of 5 tons capacity, alternately filling and dumping. When one becomes filled, the feed is shifted to the other, &c.; so that the process is simplified to a mere counting of the number of times each hopper is filled.

In this tower the bucket is operated by double-cylinder engines, consisting of a smaller engine superimposed above a larger one. The smaller, which has 10 in. by 12 in. cylinders, operates the trolly; while the larger, with 15 in. by 24 in. cylinders, operates the bucket-closing and hoist. These engines are both of the direct connected type, so that the hoisting and traversing movements are unusually rapid. The cable drums, which are 30 inches and 32 inches diameter respectively, are mounted directly upon the engine-shafts—being connected at will by special friction clutches. These are controlled from the operating-houses for all movements—the hoist by one man and the traverse by another, for facilitating the work. Very rapid unloading has been secured with this arrangement.

The belt conveyors and their arrangement are shown in the plan (fig. 2). A 24-inch reversible belt conveyor extends from the track hopper between the trimmers to the engine-house, where

* We take the opportunity of correcting here an accidental slip of the pen, by which the above-named publication was not given as the source of the article on the "Watt Suction Gas Producer," with the illustration accompanying it, which appeared in the "JOURNAL" for the 6th ult. (p. 359).—ED. J. G. L.

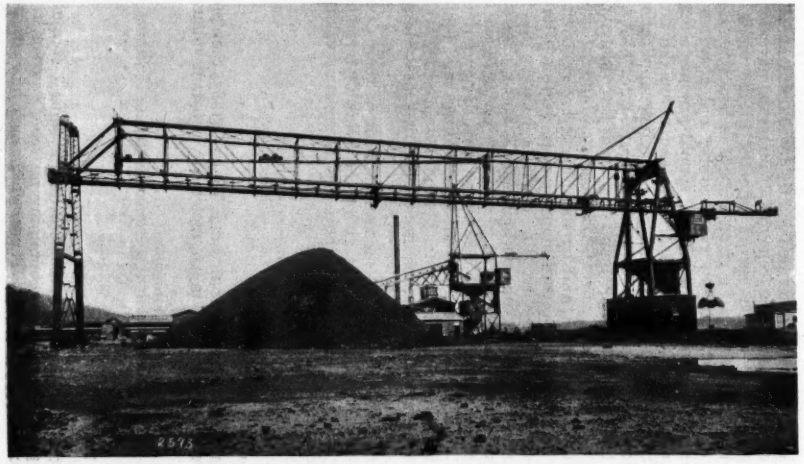


Fig. 3.—Bridge Tramway Spanning Bituminous Coal Pile.

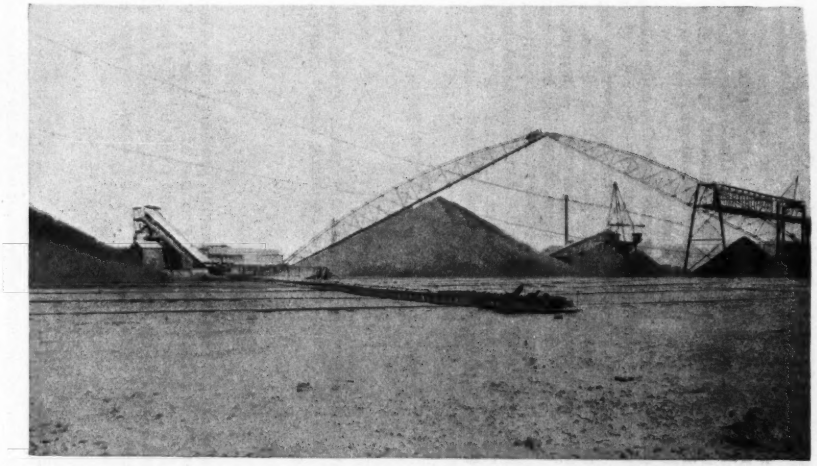


Fig. 4.—General View of Anthracite Piles and Pivotal Reloader.

it discharges on to a 24-inch inclined belt conveyor delivering up into the 40-ton hopper in the tower for loading on to vessels, or receives, by another inclined descending belt conveyor of the same size, coal that is taken from vessels and weighed in the steeple tower, and discharges it on to the storage piles. The belts are operated at a speed of 600 feet per minute, being driven by a 12 in. by 16 in. single engine located in the small engine-house situated midway between the steeple tower and the storage piles. The combined capacity of the unloading and weighing apparatus in the steeple tower and the belt conveyor system and trimmers is about 800 tons per day of ten hours, with average working, although under the most favourable conditions nearly 1200 tons have been handled in ten hours.

For the removal of coal from the piles, the reloading system includes a reversible side scraper conveyor of the pivotal type, swinging over a radius of 300 feet, which delivers at its pivot to a 30-inch inclined belt, feeding 5-ton weighing-hoppers that spout to the reversible conveyor (fig. 4). It is carried on ten lines of circular track, one of which is used for the cable mechanism for moving the reloader into the piles. The possible movement is sufficient to cover the entire area occupied by both piles. This reloader, as well as the trimmer mechanism, is operated by a 16 in. by 18 in. single engine in a house at the rear of the reloader tower between the piles. The capacity of the reloader is, under ordinary conditions, 1500 tons per ten hours, though this rate has been considerably exceeded.

The three engine equipments are supplied with steam for operating the anthracite-handling system by a boiler plant in a building near the dock, which also serves as an electric lighting plant, shop, and office. There are two 6 ft. by 18 ft. horizontal tubular boilers rated at 150-horse power each. The lighting plant comprises a 100-kilowatt electric 240-volt generator, directly connected to a 150-horse power engine. This is used for the lighting of the yard and apparatus.

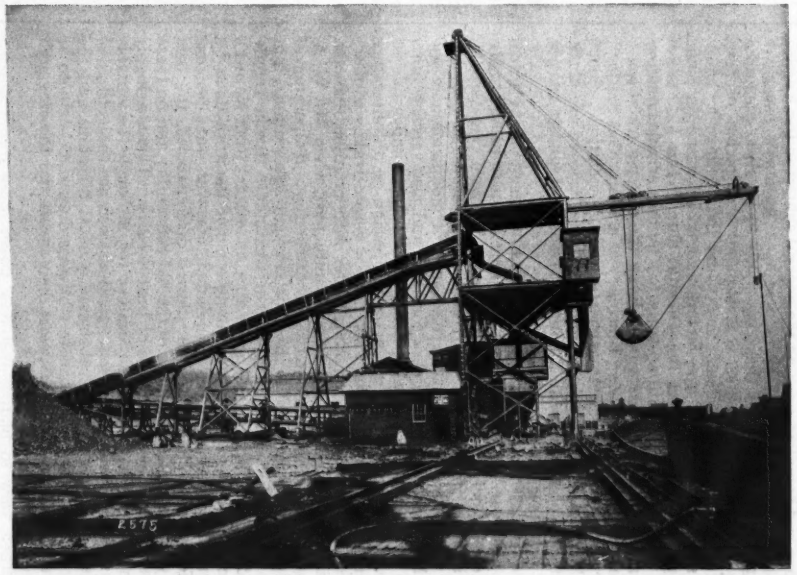


Fig. 5.—Inclined Belt Conveyor, Steeple Tower, and Bucket.

With the object of paying a tribute to the memory of the late Mr. C. R. Bellamy, the Tramways Manager of the Liverpool Corporation, and of offering a token of regard to Mrs. and Miss Bellamy, an interesting function took place at the Town Hall last Thursday afternoon. It consisted in the presentation by the staff of the Tramways Committee of a beautiful silver rose bowl and a purse filled with gold to Mrs. Bellamy, and a violin to Miss Bellamy. The Lord Mayor (Alderman Joseph Ball) presided over a large gathering. Mr. Llewellyn, on behalf of the staff, mentioned that the presentation was originally intended for their late chief; but as this was now, unfortunately, not possible, they desired to make some recognition of the kindness they had received, and the goodwill that had always existed between themselves and Mr. Bellamy. Every member of the staff had been able to contribute towards the presentation, which he asked the Lord Mayor to make on their behalf. His Lordship complied in some well-chosen remarks; and he concluded by requesting Mrs. Bellamy, in the name of the whole of the tramways staff, as a mark of their regard for her, and in memory of her late husband, and with the sense of his own personal respect, to accept the presents, with the fervent hope that she might be long spared to see her sons grow up and enter upon careers as distinguished as that of their father. Mr. L. C. T. Bellamy, on behalf of his mother and sister, suitably acknowledged the presentation.

THE SPECIFIC HEAT OF GASES.

By Dr. H. B. Harrop, of Milwaukee (Wis.).

The plodding genius of Regnault is responsible for many of the physical laws and constants that underlie the natural science of to-day; and where the French physicist generalized too freely on insufficient evidence, or committed other palpable errors, our latter-day computations often err to a considerable extent. Experiments reaching in no case more than 200° or 300° above ordinary temperatures, and in no sense thorough or searching, serve as the foundation for the commonly-accepted views on the specific heat of gases; and, although Regnault himself observed variations with temperature, and offered formulæ to express them, the suggestion that the values might safely be taken as constant has had almost universal acceptance. About twenty-five years ago, a number of French physicists and chemists—notably Berthelot, Sarrau, Vieille, Mallard, and Le Chatelier—began to investigate the heat capacity of gases actually raised to the temperatures found in flames and explosion mixtures. These experiments were liable to numerous influences making for error; and though they have been repeated since, both in and out of France, and put upon a surer footing, none of the results attained has received wide-spread recognition.

It is a surprising fact that most of the writers on heat, treated as a mathematical quantity, do not seem to know that the Regnault constants are even questionable. Barker's "Physics"—the most modern and complete work on the general subject in the English language, and employed as a text-book in many American colleges at least—utilizes these constants in involved computations of flame temperature, &c., without a suspicion of fear. Most of the Universities teach them; and the engineering handbooks reprint them and the factors and tables based on them. The gas industry, to which fundamental data of this kind are of vital importance, has, until recently, had for the variable functions a total ignorance and disregard. Even the classics are at sea—witness Mr. A. G. Glasgow's "Efficiency of a Water-Gas Setting" (see "Proceedings of the American Gaslight Association," 1890,*) and Mr. H. A. Humphrey's "Mond Gas" (see Proceedings of the Institution of Mechanical Engineers, London, January, 1901,†), both based on the Regnault values.

The credit for being the first in the gas industry to make actual use of any variable specific heat functions seems to belong to Mr. Frederick Bredel, whose paper before the Western Gas Association in 1892‡ presented a chart containing curves for CO_2 and H_2O which were extensions of the Akerman modification of the first Mallard and Le Chatelier formulæ, and also variable functions for O_2, N_2, and CO, whose source it has been impossible to trace. This publication made no impression on the literature of the gas industry, although the curves were certainly of more value, and gave results agreeing better with practice, than the Regnault constants; and it was not until 1903, when Mr. W. A. Baehr presented his paper on the "Construction and Operation of Recuperative Furnaces" to the Ohio Gaslight Association,§ that this subject again received intelligent treatment. Baehr republished the Bredel chart, and gave also an extract from Nernst's "Theoretical Chemistry," describing some of the work done by various experimenters. He concluded, however, that because the formulæ he had gathered showed discrepancies, the best policy was to continue the use of the old constants; and on these he based all his computations of heat-balance. This is a highly erroneous view to take of the matter; for, although the variable functions proposed by different experimenters are subject to disagreement, they all point in the same general direction, and the disagreement among the trustworthy data does not begin to be so great as the variation between their mean and the Regnault values.

With a view to finding just how much these disagreements amounted to, and discovering if fairly dependable curves could not be deduced, I undertook to compile the material published on this subject up to the present time in America and Europe; and correspondence was begun with some of the foreign physicists who have worked on the problem. A great deal of trouble was experienced because the original British, French, and German publications were not available in some cases; and many of the general works of reference—like Castell-Evans's "Physico-Chemical Tables," Landolt and Börnstein's "Physische-Chemische Tabellen," Lüger's "Lexikon," and Nernst's "Chemistry"—which were relied on at first, were full of errors of transcription. I am indebted to Professor James Boyd, of the Ohio State University, for looking up matter in the "Comptes Rendus;" to Professor Alfred H. White, of the University of Michigan (whose lecture before the American Gaslight Association in 1903 presented tables he had newly calculated from the Mallard and Le Chatelier formulæ of 1888),‖ for furnishing me with two formulæ by different investigators that must otherwise have escaped; to Professor Jos. W. Richards, of the Lehigh University (who has for several years been using in his class-room formulæ from the Mallard and Le Chatelier paper in the "Annales des Mines"); to Professor Harold B. Dixon, of the Victoria University, Manchester (who has conducted some elegant researches into explosion-wave velocities); to John S. Unger, for translating the Akerman paper from the Swedish; to Ch. Ed. Guillaume, physicist, of the International Bureau of Weights and Measures, for valuable references; to Louis Oliver, for back numbers of French documents; to H. Le Chatelier; to Frederick Bredel; and especially to P. A. Degener, now of the Underwriters' Laboratories, Chicago, for searching original documents in the Lehigh library and in New York City, and for unmeasured help in recalculating and plotting the various formulæ.

Regnault passed a known amount of gas through a coil enclosed in a calorimeter, and calculated the heat exchanged for given temperature differences. Wiedemann later improved on this method by filling his coil with silver filings, hastening the absorption, and making the apparatus less cumbersome. The method lends itself readily to the determination of specific heats only at points in the neighbourhood of ordinary room temperatures. They agreed very nearly on a mean value, but failed to establish definitely the slope of curves to represent variations of value as the temperature changed. The subjoined tabulation shows the extent of their work on CO_2, for instance—

Regnault.		Wiedemann.	
− 30° C. to + 10° C.	0·18,427	0° C.	0·195
+ 10 ,, + 100	0·20,246	100	0·216
+ 10 ,, + 200	0·21,692	200	0·239

The commonly used figures on the ordinary gases, derived from Regnault's "Memoires," and taken as constant for all temperatures, are these—

CO_2	0·2163	N_2	0·2438
H_2O	0·4805	O_2	0·2175
CO	0·2479	H_2	3·4090

These represent specific heats at constant pressure; the values being in terms of small calories per gramme of gas—or B.T.U. per pound of gas. These values are made over, by multiplying by their several specific gravities, to show the specific heats at constant pressure for equal volumes (or for equal numbers of molecules) thus—

CO_2	0·3307	N_2	0·2368
H_2O	0·2989	O_2	0·2405
CO	0·2393	H_2	0·2359

The last four so-called permanent gases, it will be seen, come out very much alike. It is interesting to note that later determinations, made at constant volume by the explosion method, go to show that, among the permanent gases, equal numbers of molecules have exactly the same heat capacity, or, as it is expressed, *the molecular specific heats of all the permanent gases is the same.* Whence it follows that the specific heats of like masses (weights) of the several permanent gases, even at ordinary temperatures, will be found to vary somewhat from the figures above tabulated. [It may be noted here, in passing, that, although the specific heat is now believed to vary with the temperature in all the permanent gases, the law just italicized seems to hold, so that for equal volumes the variation is identical.]

In order to make determinations at very elevated temperatures, the method of explosion in closed vessels was devised. The most work in this direction was performed jointly by Mallard and Le Chatelier; and their researches (repeated at intervals) have done much to eliminate the various errors inherent in the method. The underlying principle—that a given amount of heat generated in a definite quantity of a known gas mixture, and distributed through a resulting amount of products, should produce a temperature, and consequently a pressure, dependent on the heat capacity of the products—is affected in its practical application by a multitude of phenomena, such as the absorption of heat by the walls of the vessel. And the result is more or less vitiated by the necessity of distinguishing between true pressure and apparent pressure due to mere impact, and by the difficulty of contriving a gauge that will accurately record momentary pressures. Moreover, the determinations are made at constant volume; and it was necessary to settle the relation between C_v and C_p so that observed results might be converted to constant pressure values in order to make them applicable to many uses, discover if the relation of C_v to C_p is the same for all temperatures, and (quite as important) find out whether values determined under the great pressures employed in the experiments were also true for the lesser pressures occurring in ordinary practice.

Mallard and Le Chatelier published an account of their early work ("Comptes Rendus") in 1881, giving the following formulæ, representing the mean specific heat above 0° C. at constant volume for a molecular equivalent of gas:—

$$CO_2 = 6{\cdot}30 + 0{\cdot}00564t - 0{\cdot}00000108t^2$$
$$H_2O = 5{\cdot}91 + 0{\cdot}00376t - 0{\cdot}00000155t^2$$
$$CO,\ N_2,\ H_2,\ O_2 = 5{\cdot}00 + 0{\cdot}00062t$$

Two years later, in the "Annales des Mines" (1883) they presented revised formulæ, also mean, molecular, constant volume, thus—

$$CO_2 = 6{\cdot}26 + 0{\cdot}00367t$$
$$\text{or, } = 6{\cdot}30 + 0{\cdot}006t - 0{\cdot}00000118t^2$$
$$\text{or, } = 4{\cdot}74^3\ \sqrt{T} \times 10^{-2}$$
$$H_2O = 5{\cdot}61 + 0{\cdot}00328t$$
$$CO,\ N_2,\ H_2\ O_2 = 4{\cdot}8\ + 0{\cdot}0006t$$

In 1888, the "Séance de la Société de Physique," formulæ (representing further revision, containing no second power, and therefore rectilinear) appeared. These, which took into account

* See "Journal," Vol. LVI., p. 1338. † *Ibid.*, Vol. LXXVI., p. 1509.
‡ *Ibid*, LX., p. 158. § *Ibid*, Vol. LXXXII., p. 370.
‖ *Ibid*, Vol. LXXXIV., p. 620.

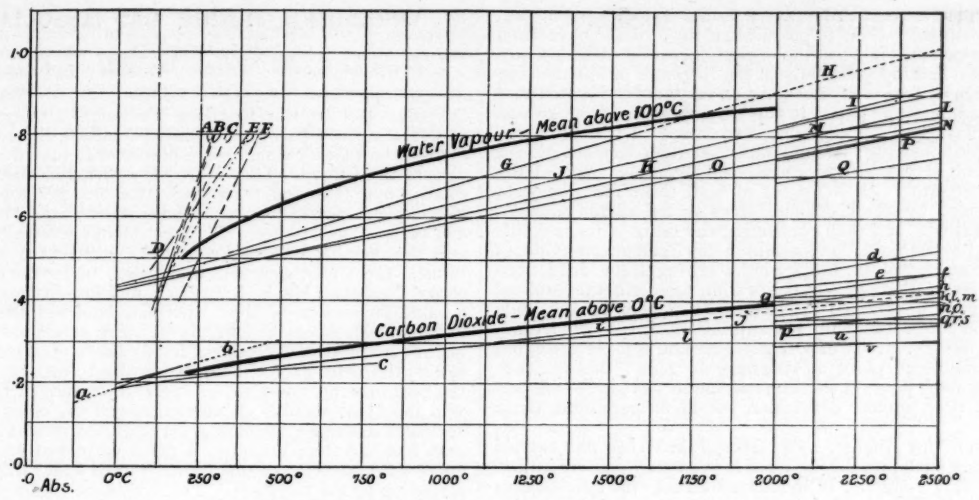


CHART 1.—Specific Heats of H_2O and CO_2—C_p – 1Gm Mean.

KEY.

WATER VAPOUR.

A Grindley (mean above 100° C.).
B Grindley-Reeve ,,
C Greissmann ,,
D Jones ,,
E Orrok ,,
F Emmett ,,
G Akerman.
H Bredel.
I Weyrauch.
J Mallard and Le Chatelier, 1881.
K Mallard and Le Chatelier, 1883.
L Derval.
M Vieille and Berthelot.
N Sarrau and Vieille.
O Mallard and Le Chatelier, 1888.
P Richards (class-room).
Q Langen.

CARBON DIOXIDE.

a Regnault.
b Wiedemann.
c Holborn and Austin.
d Richards (class-room).
e Ihering.
f Richards (own).
g Vieille and Berthelot.
h Le Chatelier (on absolute scale).
i Akerman.
j Bredel.
k Mallard and Le Chatelier, 1888.
l Ostwald (on absclute scale).
m Weyrauch.
n Mallard and Le Chatelier, 1883 (first power).
o Schöttler.
p Cartel.
q Mallard and Le Chatelier, 1883 (second power).
r Lüders.
s Slaby.
t Mallard and Chatelier, 1881.
u Langen.
v Derval.

the work of Sarrau and Vieille, &c., also are mean, molecular, and at constant volume.

$$CO_2 = 6{\cdot}50 + 0{\cdot}00387t$$
$$H_2O = 5{\cdot}78 + 0{\cdot}00286t$$
$$\text{Permanent} = 4{\cdot}76 + 0{\cdot}00122t$$

Richard Akerman, in "Jernkonterets Annaler" (Stockholm, 1891), took the Mallard and Le Chatelier data of the "Comptes Rendus" (1881), and with the aid of data on the relation of C_v to C_p from work done by Regnault, Wiedemann, Winkelmann, and Wüllner, deduced C_p curves for CO_2 and H_2O that differ considerably from the C_p formulæ deduced by Mallard and Le Chatelier themselves. He used these curves (which he extended only to 1800° C. and 1600° C. respectively) in connection with a treatise on blast-furnace theory; and, being in Swedish, they seem to have made very little impression. Bredel, however (as before mentioned), continued the Akerman curves graphically to 2500° C.; and he appears to have been the first to use any variable specific heat functions in the gas industry. [Chart I (G, H, *i*, *j*,).]

Professor Joseph W. Richards, of the Metallurgical Department of the Lehigh University, has for several years been teaching the following formulæ in the class-room:—

$$CO_2 = 0{\cdot}37 + 0{\cdot}00027t$$
$$H_2O = 0{\cdot}34 + 0{\cdot}00013t$$

Representing mean specific heats at constant pressure in terms of great calories per cubic metre. Converting to small calories per gramme of gas—

$$CO_2 = 0{\cdot}187 + 0{\cdot}000136t$$
$$H_2O = 0{\cdot}419 + 0{\cdot}000161t$$

These are shown on Chart I (*d*, P). They were calculated from the formulæ of "Annales des Mines" of 1883; but, as will be seen, they do not agree with the originals (*q*, K), the cubic metre formulæ for CO_2 having obviously been derived from the original formula by ignoring the second-power term. The nature of the error committed in calculating the H_2O formula is not evident.

Professor Richards has more recently arrived at conclusions with respect to CO_2—from a study of furnace combustion—that entitle his results to a place among the original investigations. In a letter dated Jan. 25, 1905, he says: "I have . . . particularly compared the actual temperature of combustion with the calculated one [carbon burning to CO_2]. From this study, it appears that the specific heat per cubic metre is $0{\cdot}37 + \beta t$, with β somewhere between 0·16 and 0·25. I think myself the value may be about 0·22. I have been using 0·27." This formula, with the value 0·22, is shown in Chart I, Curve *f*.

German writers frequently refer to the formulæ of Langen, Chart I (*u*, Q), deduced from gas-engine work, and very low in comparison with most of the other figures. They are—

$$CO_2,\ C_p = 8{\cdot}7 + 0{\cdot}0026t$$
$$H_2O,\ C_p = 7{\cdot}9 + 0{\cdot}00215t$$

On the scale of absolute temperatures, and taking the various vapours and gases to start from a common value at absolute zero, Le Chatelier gives ("Zeitschrift für Physische Chemie," I., 456, 1887),

$$CO_2 = 6{\cdot}5 + 0{\cdot}0084T$$

and Ostwald gives

$$CO_2 = 6{\cdot}8 + 0{\cdot}00742T$$

the temperature co-efficient increasing in a general way with the complexity of the molecule. The general formula, $C_p = K + a\,T$, taking one or the other of the values for K, and with a list of values for the co-efficient *a* corresponding to several gases and vapours, either according to Le Chatelier or Ostwald, is not infrequently used in some quarters to calculate specific heats. But the evidence which will be presented a few paragraphs later on, regarding the proper curvilinear nature of the functions, is opposed to this procedure.

In the "Journal für Gasbeleuchtung" for 1901, Ihering attempts to harmonize a number of formulæ for CO_2 that he has collected; and he finally adopts a *locus* that gives higher values than any published figures for the mean specific heat of this gas except the "class-room" formulæ of Richards, which was just shown to be deduced through an algebraical error. The formulæ used were credited to Mallard and Le Chatelier, Slaby, Lüders, Weyrauch, Schöttler, and Vieille and Berthelot; and they were sent to me by Mr. A. H. White, as previously noted. I spent a good deal of study on this collection, as it was not only self-contradictory, but also disagreed with data from other sources. The facts appear to be as follows: The Vieille and Berthelot formula is correct. The Mallard and Le Chatelier formula is the second-power formula of the "Annalles des Mines" of 1883. The Slaby formula is identical with this. The formula credited to Weyrauch is merely the Mallard and Le Chatelier formula of the Séances de la Société Physique" of 1888, with the slope raised to give real or instantaneous values. The Lüders formula is the second-power Mallard and Le Chatelier formula of the "Annalles des Mines" raised to give real values. The Schöttler formula is the first-power formula of Mallard and Le Chatelier of the "Annalles des Mines" raised to real. I show these several data, all mean, in Chart I. (*g*, *o*, *m*, *r*, *s*, *q*), and the function adopted by Ihering (*e*) above them all. This is a good illustration of the pitfalls that have beset this compilation.

The high-temperature formulæ are mostly right-line functions

ending at their lower extremities in values agreeing with Regnault. The opinion seems to prevail that the formulæ have been deduced anew entirely from the explosion results at a series of temperatures, and independently of the Regnault or Wiedemann determinations. One well-known American teacher insisted that from his reading of the paper in the "Comptes Rendus," he was certain Mallard and Le Chatelier had based their conclusions on their explosions only; and the fact that their formulæ agreed with Regnault at low temperatures was a corroboration of the earlier investigator. As a matter of fact, these formulæ were mainly attained by locating some values in the region of explosion temperatures, and then connecting the mean of these points by a right line with the long-accepted low-temperature values; any curvature found in the formulæ arising from deductions regarding the relation of C_p to C_v, or from some other theoretical modification. I questioned Professor Le Chatelier directly upon this point, in connection with his own formulæ, and will let him speak for himself: "Nos expériences, comme vous le dites, ont seulement donné un point au voisinage de 2000° [this is Centigrade, of course] pour la chaleur spécifique des gaz, et ne permettent de tirer aucune conclusion sur la forme exacte de la courbe."

In "Power" for August, 1904, George A. Orrok has carried the discussion back into the region of low temperatures by gathering and plotting a number of investigations into the specific heat of superheated steam; and these, in conjunction with the graphic representation of formulæ based on high temperature determinations for water vapour, present some startling features. [See A, B, C, D, and F, Chart I.] The Englished version of the Regnault formula for total heat of steam,

$$\lambda = 1091{\cdot}7 + 0{\cdot}305\ (t - 32) + (t_s - t)\,Cp$$

combined with the Greissmann ("Zeit. Verein. Deutsch. Ingenieure") formula for the mean specific heat of superheated steam above saturation temperature,

$$Cp = 0{\cdot}00111\ (t_s + t) - 0{\cdot}116$$

and giving

$$\lambda = 1091{\cdot}7 + 0{\cdot}305\ (t - 32) + 0{\cdot}00111\ (t_s{}^2 - t^2) - 0{\cdot}116\ (t_s - t)$$

is now being used to some extent by mechanical engineers.

Orrok has gone into the low-temperature figures experimentally; and at a later date (Sept. 25, 1905) he adds: "The values in the paper are dependent in large measure on the accuracy of Regnault's values for the total heat of steam. I am also working on the change in Regnault's values for the total heat; and probably I shall flatten the slope of the curve quite a little before I get through—using perhaps the formula I gave at the end of the article, which seems to be relatively nearer the truth." [Private communication.] The formula referred to is $Cp = 0{\cdot}0016t + 0{\cdot}041$, and is based chiefly on tests of separately fired superheaters; t being in degrees on the Fahrenheit scale. This is shown on Chart I. (E) converted to indicate mean specific heat above 212° Fahr.

It seems impossible to escape the conclusion that, at temperatures just above the normal boiling-point of water, the slope of the specific heat curve of water vapour is very great. The figures given by Grindley, Grindley-Reeve, Greissmann, and Orrok agree within narrow limits. If this slope were continued out into the region of flame temperatures, the results would be absurd; for combustion of a gas containing hydrogen would give no appreciable temperature. It follows that either the curve is discontinuous or else that the function is strongly curvilinear. A curvilinear function [marked "Water Vapour"] based on the experiments on superheated steam and on the reliable explosion determinations, is shown in Chart I.; and I offer this as harmonizing the various data of any worth, and affording a curve dependable within a smaller probable range of error than any value or formula now in use. The curvilinear function [marked "Carbon Dioxide"] is offered with a less degree of confidence—based in part on the reliable explosion data and the slopes of Regnault and Wiedemann, and in part on analogy with the new water vapour curve. The fact that this function is less striking than the other may in some degree offset the greater uncertainty that attends its derivation.

(*To be continued.*)

Production of Carbons for Arc Lamps.—At the invitation of the General Electric Company, Limited, of Witton, Birmingham, a number of Press representatives recently visited the works for the purpose of witnessing the manufacture of arc-lamp carbons. The raw materials employed, as many of our readers are doubtless aware, are gas-retort carbon, soot, and tar. In the course of an account of the visit, our contemporary the "Ironmonger" says: "It seems an irony that, before the electric light can be placed in our streets, it is necessary for manufacturers to purchase from the gas companies what is practically a bye-product. Gas-retort carbon, however, as it is formed, is not always suitable for the manufacture of carbons. Great care has to be taken in purchasing, and practically every parcel is examined by an expert of the Company before it is ordered. Even when it is received, it has to be carefully selected and cleaned by hand—a squad of men spending the whole of their time hand-picking the product as it comes in."

YORKSHIRE JUNIOR GAS ASSOCIATION.

A considerable departure from the ordinary proceedings marked the meeting which the Yorkshire Junior Gas Association held on Saturday last at the Bradford Technical College. A list of twelve questions had been circulated among the members, with the request that all would come prepared to take their part in the discussion of them. They were very varied in their nature, and roamed over many points of theoretical and practical interest, so that everyone found some question or other touched his experience and personal knowledge. The experiment proved a great success; and the meeting had evidently been anticipated with keen interest. Over fifty members assembled, under the chairmanship of the President, Mr. E. J. Sutcliffe, and for close on three hours a rapid succession of short speeches held the attention of the meeting. Members had journeyed in from distant places; and no one left until the President finally announced that the discussion of the latter half of the question-sheet must remain over for the next monthly meeting. A notable feature of the discussion was the great number of maiden speeches; many of the usual speakers remaining silent or reserving their remarks till the new ones had had their innings. A great variety of personal experiences was adduced, and many facts quoted which will be gratefully stored up by the members. The President kindly slackened the strict rules of debate, with the result that a running fire of supplementary questions and answers kept attention and interest from flagging, and certainly avoided monotony. The universal verdict at the close was that a most enjoyable and profitable form of meeting had been developed, from which much might be expected in the future—especially as an official invitation was given to all members to send in to the Secretary questions over which they had met with difficulty, and which might suitably be discussed at future meetings.

The meeting was opened with the announcement of the gift from Mr. Tooley, of Leeds, of sixteen volumes of the "Transactions of the Gas Institute," for which the thanks of the Association were accorded, on the motion of Mr. Hill, seconded by Mr. M'Nab.

The President, in introducing the question paper to the meeting, spoke of the variety of subjects suggested, the openings they afforded to all the members, and the personal advantage the meeting might yield, not only in information conveyed, but in encouragement to the usually silent members to come forward and share in the advantages accruing from practice in putting their thoughts and experiences into words. His hopes and suggestions were fully borne out in the subsequent discussions.

What is the best method of adding a measured quantity of air for revivification of oxide in situ?

Mr. Shepherd advocated introducing the air at the inlet to the purifiers by means of a Root's blower or a Körting steam-jet injector, and measuring through a meter. He wished to know if any objection could be sustained against the introduction of the steam into the purifiers. Mr. Cawthra quoted an instance in his experience where 1½ per cent. of air, metered, was thus introduced by means of a steam-jet; and the arrangement proved quite satisfactory. To avoid too serious a rise in temperature, new oxide was only introduced after admixture with old. Mr. Lang had seen a case in which a small pump actuated from an eccentric on the shaft of a washer passed air into a holder 6 feet high and 6 feet diameter. This delivered air at a steady and even pressure through a meter and into the hydraulic main. A kind of safety-valve on the top of the holder allowed the surplus air to escape when the holder was at its full height. Mr. Roberts and Mr. M'Nab quoted instances of air being drawn in at the inlet to the condensers, and urged the advantages of this method. Mr. Scholefield had seen this tried and abandoned, because of tar being driven back into the meter during short spells of enhanced pressure, with the result that the meter was stopped. Mr. Ablett and Mr. Lang had worked in this way without any trouble from tar getting into the meter. Mr. Butterfield spoke of the great increase in the amount of gas which he could pass through his oxide boxes without changing them, since he had introduced air. He advocated the intervention of a seal-pot between the air-inlet and gas travel, so as to lessen the trouble from an occasional increase of pressure, and spoke of one case where he had seen air drawn in, without any meter interposed, through a ½-inch tap on the hydraulic main. Mr. Booth referred to a case where air was drawn in by a 3-inch pipe attached to the inlet of the exhauster through a 100-light wet meter. The inlet was closed by a 3-inch sluice-valve, by which the admission of air could be regulated. The device worked well—or at least would have continued to do so if the responsible man had faithfully entered up the readings of the meter, and had refrained from bringing the experiment to an untimely and violent end. No trouble arose with back-pressure, because the meter simply would not work back. Besides, such back-pressure, with the added pressure due to the seal of the dip-pipes, would soon show itself at the retort-lids. In connection with an installation of Tatham oxy-oil gas, where oxygen had to be continuously added in proportion to the amount of oil gas used, a separate meter was employed for each, of a size proportioned to the relative amounts to be delivered. The spindles of the drums were lengthened and connected, so that the meters worked at a uniform rate. The President spoke of an experience similar to Mr. Scholefield's.

The meter was a dry one, because the position in the retort-house was unsuitable for a sufficiently large wet one; and the valves so constantly stuck with tar that the arrangement had to be abandoned. Mr. Smith inquired if anyone present had ever systematically analyzed the gas in order to check the record of the meter. His experience was that the meterage alone was very misleading; and that by sampling for 24 hours he had found an excess of 10 to 15 per cent. of air present. Much of this would be due to unsealed dips; and it was absolutely necessary to know the exact amount of oxygen in the gas, if one was going successfully to deal with sulphur purification by means of lime. It was of little use having great refinements of procedure in one part of the plant if one had faulty arrangements neutralizing them in other parts.

What is the best position in which to place the exhauster relative to the other apparatus?

Mr. Sutton spoke of the difference it had made at the works on which he was, when the exhauster had been brought from after the washing plant to the front of it; while Mr. Ingham related his experience of the working of a scrubber with an exhauster placed after it. Mr. Thornton knew an exhauster at the condenser inlet, and no trouble was experienced with regard to its pitching up, though he admitted that they did not entirely rely on its lubrication by tar oils, but added a lubricating oil in the usual way. Mr. Benn, Mr. Roberts, and Mr. Demain all told a contrary tale of exhausters pitching up when put before the condensers, and of the extreme difficulty of restarting them after even a few hours standing. Mr. Booth defended the usual position, on theoretical grounds. It was advisable to effect condensation under the lowest practicable pressure, because the gas thus carried more of the light hydrocarbons than if condensed under pressure; besides, pressure in the washing plant meant that the liquor dissolved more gases. Mr. Ablett referred to the fact that the capacity of an exhauster was calculated for gas at 60° Fahr.; and if one worked gas at a much higher temperature through it, one might easily work it beyond its proper maximum capacity.

Is it a wise policy for gas undertakings to adopt a special rate for gas sold for power purposes, low enough to bring it into competition with suction gas? If so, how should the rate be determined?

Mr. Demain had had some complete specifications of suction-gas plant through his hands lately, and noticed that the claim was made that gas of half the efficiency of coal gas could be made for 4d. per 1000 cubic feet. He thought this was much too rosy a forecast, and that instead of 8d. being the cost of an equivalent to coal gas, from 1s. to 1s. 6d. was nearer the mark; while, taking depreciation, repairs, &c., into consideration, 1s. 6d. was the most likely figure. He thought it best to sell at 10 per cent. above the actual cost as delivered at the meters, and that such a price for the town gas, with all its convenience, would carry over most large consumers. The price should also be varied according to consumption; and in general every effort should be made to secure possible suction-gas users, as power gas was essentially a day load. Mr. Benn brought forward the gas company's standpoint, where a recognized dividend had to be ensured. He thought that unless a large extra day load could be secured, a heavy reduction to power users would be disastrous. Mr. Parrish was in favour of such reduction, so long as the eventual result was profitable. It would lead to an increase in the day load which did not involve a corresponding increase in maintenance charges. The gas industry should emphasize the fact that suction-gas plants were not equally suitable for all classes of work, and were eminently unsuitable for some; while the difficulty of working and attendant risks were all too lightly estimated. Mr. Booth, in traversing the previous speaker's remarks, pointed out that gas-works were not in the same position as electricity works as regards storage, and that day loads means very different things in the two cases. Gas-works usually could store a maximum day's make, and the holders thus balanced the load, and enabled the engineer to work with a constant rate of production; so that he strongly questioned whether the unequal rate of day and night consumption affected the production costs. Rather than judge by day load, he would be guided by the annual load-factor. In reference to lower rates for increased amounts, he would point out to Mr. Demain that it was then conceivable that, in the case of a man burning just short of one of the even millions of cubic feet of gas, by burning a few extra feet he might get a so much greater discount allowed him that the extra gas would be obtained for nothing. Mr. Roper gave details of the custom at Bradford, which he claimed was the better way—viz., one uniform initial charge for gas for all purposes, with an increasing scale of discounts according to the gross amount of the bill. They had a carefully thought-out and officially published arrangement for meeting the case of any man who was only a shilling or so below the figure for an extra discount. As regards lower rates for engines, he greatly doubted if the total consumption from this source was as great as was often imagined, or as much worth making great concessions for. In Bradford, not more than 4 per cent. of the total output was used in engines; and in many of these cases the half-yearly consumption of an engine was only from 10,000 to 20,000 feet. Mr. Fligg spoke of the two separate rates for power and lighting in use at Dewsbury, and the employment of a check meter to ascertain the proportion of a consumer's total gas that was used for power. They were satisfied with the wisdom of this arrangement locally, and were much struck by the interruption to an otherwise uniform yearly increase of power gas used in the case of a temporary advance in its price owing to a rise in coal. Mr. Smith called attention to the fact that engine users were not always the largest customers of a gas-works, but that at Halifax much greater amounts were used for tempering wire, singeing, &c.; and the size of the mains laid to a works was an important consideration. His advice was not to bother to keep a customer who was hankering after suction gas. After a little he would begin to realize how many factors he had overlooked. Repairs would begin to be troublesomely frequent, the cost of water might not be trifling, anthracite would possibly rise in price; and in a few years many of the suction-gas enthusiasts might be glad to return to coal gas. He agreed that a uniform rate, with varying discounts, was the most equitable and satisfactory method of making charges. Mr. Stones said that at Elland the craze for the new gas was so great that many would prefer it even to coal gas at 1s. 6d. As the distributing charges were proportionately less for large consumers, he thought that a varying charge must in all fairness be added to the fixed cost per 1000 cubic feet into the holder, so as to arrive at an equitable scale of charges. Mr. Walker pleaded for reductions to small power consumers so as to avoid their resorting to electric motors—a form of competition which was increasingly severe in some parts.

In working a sulphate of ammonia plant where there is a fixed and a free ammonia still, is there any rule as to the steam pressure there should be on each still, and what would be the effect on the saturator and the sulphate of an excessive and also an insufficient amount of steam?

Mr. Shepherd pointed out that there could be no fixed rule, inasmuch as exhaust steam was sometimes used and some plants actually worked at a vacuum. Many factors entered into the case—the height of the still, the amount and rate of liquor passing through, the number of trays, the depth of liquor on each, and the resistance offered by the purifiers, &c. Insufficient steam would cool the saturator, the waste gases would be cooler, and the incoming liquor cooler; and ammonia might be needlessly lost in the waste liquors. The salt would probably be sloppy and perhaps dark coloured; while any sudden recovery of steam pressure would probably result in "priming" of the still and consequent blue sulphate being formed. Excessive steam supply might cause priming, and might make the saturator and its connections so hot that incrustation might take place in the ammonia pipe, and a kind of double pipe be formed in which ammonia might slip between the incrustation and the pipe, come into too brief contact with the acid, and not be entirely absorbed. Excessive pressure might also blow the seals on the condensers, &c. Mr. Parrish confirmed these remarks, and stated that he generally had to keep about 1 lb. or 2 lbs. more pressure on the fixed than on the free still; but the exact figures were largely determined by the special plant and its working conditions. He had known excessive steam pressure result in the saturator of one plant boiling over; but this was also helped by back-pressure along the waste-gas pipes, as these led to the oxide ovens of a vitriol plant. They had from several remote works liquors of 8° Twaddel strength, with about 3·1 per cent. of free ammonia and 0·3 or 0·4 per cent. fixed. These were reserved and treated exceptionally. Mr. Smith also emphasized the fact that the steam needs of different makes varied, and even those of separate stills of the same make. He had found as much as 12 lbs. difference necessary between a fixed and the accompanying free still.

Which do you recommend, a wet or a dry meter, and why?

Mr. Pacey detailed the usually given advantages of a dry gas-meter—viz., price, less cost of examining, longer life, &c.—and referred to the greater time spent in fixing a wet meter, because of the need of its being truly level. For this, he was sharply overhauled by several later speakers, who pointed out that a trained man will set a meter properly without a long performance with spirit levels, and that any such difference in labour as he had indicated was a negligible quantity in actual experience. Mr. M'Nab, in advocating the superior merits of a dry meter, called attention to the fact that wet meters were by law tested at 5-10ths pressure, and had then to be accurate within the limits of 2 per cent. fast and 3 per cent slow. Wet meters were seldom (if ever) actually worked at so low a pressure; and the greater pressure tended to depress the water-level in the drum, and allow more gas than was registered to pass. Mr. Fligg sturdily stood up for wet meters. The extra cost of inspecting, he said, was no very great matter, and was preferable to the loss through perforations in the skins of dry meters, which in many cases might go on for several years before being detected. Mr. Roberts quoted cases he had come across of dry meters being from 45 to 65 per cent. slow. Mr. Smith referred to the universal use of wet meters for experimental work. Modern compensating wet meters met many of the objections raised on the score of fraudulent handling, excessive gas pressure, &c. Mr. Fell referred to the fact that dry meter diaphragms sometimes got troublesomely dry and inelastic; while there was always a possibility of leakage at

the valves. The absence of any automatic marking of a limit for slow working was a radical disadvantage.

The inlet pipe to a gasholder becomes water-logged owing to a flaw in the bottom of the syphon, which is some 6 or 7 feet below the bottom of a dry well. What steps could be taken to utilize the holder.

Mr. Scholefield pointed out, in supplementing several answers, that at Dewsbury they had had just this trouble. Some three years ago, purifier lutes began blowing in the middle of the night. After looking round, the foreman diverted the gas into another holder and the escape was stopped. Next morning a fuller scrutiny revealed the flooded inlet-pipe. At first, they tried to pump the water out. But the rate of lowering of the water-level gradually lessened; and finally they recognized the impracticability of draining the one-time dry well, as its sides had badly cracked, and the river was very near. As their storage was a good deal short of a maximum day's consumption, and as the accident occurred in winter, it was impossible to put the holder out of action in order to make any new connections. So, as the other holder was a heavier one, they filled the crippled holder from it, and then worked the gas out to the district. In the summer they put in new connections and valves, in order to make the outlet-pipe do duty alternately as inlet and outlet. Mr. Ingham pointed out that the holder might be joined up to the main leaving the works, and the gas sent direct into the district. An excess of supply over demand would then back-up into the holder, which would act as a relief holder. This plan was actually in use in some works, though not always because of a breakdown.

SCOTTISH JUNIOR GAS ASSOCIATION.

Eastern District.

A Quarterly Meeting of the Scottish Junior Gas Association—Eastern District—was held in the Heriot-Watt College, Edinburgh, on Saturday afternoon—Mr. J. Dickson (Dunfermline), the President, in the chair.

The President, in opening the proceedings, referred to the benefit the members derived from their meetings, and from the perusal of their proceedings in the Technical Press, which were, in a way, showing the members of the profession their enthusiasm and earnestness, if nothing more. They were to have that day a lecture by Mr. O'Connor, who was one of the founders of the Association. He did not confine himself to the gas industry alone, as the latest, and rather exceptional, distinction conferred upon him testified. They were honoured in having him place his services at their disposal. They were also to have a paper from Mr. Webster, and he trusted he would be rewarded for his pains in rendering their meeting interesting and profitable.

Mr. H. O'Connor (Assoc.M.Inst.C.E., F.R.S.E.) then delivered a lecture on

GAS FOR HEATING.

When asked by your courteous Secretary to deliver a short lecture this afternoon, I thought that, seeing the great interest now taken in the employment of gas for heating purposes, I could not do better than confine my remarks to that use of our product. I therefore propose first to refer to the three modes of transmitting heat—by conduction, radiation, and convection. To describe the first, I will use the familiar household poker, placed, as so many housewives are fond of doing, in the fire, as they say, "to make the fire draw." After this has been in the fire some time, and we wish to withdraw it, we find the handle is hot. It has been heated by conduction through the metal of which the poker is composed. This then is conduction—the transmitting of heat through the material of which a vessel is made, as when a kettle or a saucepan is placed on a fire, when the heat is conducted through the metal to the water inside. For the purpose of conduction of heat, different metals have different powers. I will instance a few of the more ordinary. Silver is equal to 1000, aluminium 665, block tin 422, rolled copper 840, rolled zinc 641, steel 397, cast copper 811, wrought iron 436, and cast iron 359. Thus a sheet-copper kettle will conduct twice the heat from the fire to the water that would be conducted through a block tin one; while a silver one would be better still to the extent of 19 per cent. As to radiant heat, I will again refer to the heated poker; and when we place our hand under the heated end, we feel a heat given off through the air, which must not be confounded with convected heat to be described later. It is this radiant heat that we feel when we stand in front of a fire, whether coal or gas; so that it is an important phase of the subject for us to consider. Various substances have different powers for reflecting radiant heat; for if polished brass is equal to 100, silver is equal to 90, tin to 80, steel and lead to 60, glass to 10, and lampblack *nil*. From this we see the importance of having our stoves and the surroundings of such a material as will reflect the greatest amount of this radiant heat.

Convected heat—the third stage—is the heat carried up by the air, which, as soon as it is warmed, expands, thereby becoming lighter, so that the weight of the surrounding atmosphere forces it upwards, when it is gradually deprived of its heat. This is what takes place in a chimney, and causes the "draught," which must be sustained when a gas-stove is burning; for if the products of combustion be cooled, the temperature of the atmosphere of the room will fall, and the air of the lower part of the room will contain such a large proportion of carbon dioxide as to render it incapable of sustaining life. This is the cause of so many deaths in bath-rooms, where quick-action water-heaters, consuming a large quantity of gas (sometimes as much as 100 cubic feet per hour) are in use, without sufficient ventilation to carry away the products of combustion, containing perhaps 50 cubic feet of carbon dioxide. A flue should always be provided for a gas-stove; but it need not be so large as for a coal fire, as little more than the theoretical quantity of air is needed to ensure complete combustion of the gas, though for ventilating purposes 25 per cent. of the heat is required to go up the chimney. You will remember that with the gaseous firing of retort-settings the quantity of air required is only half that used for the same quantity of fuel employed in an open-hearth setting. It is probable that the quantity of air passing up an ordinary household chimney conveying the products of burning coal, is nearer twenty times that theoretically required for the fuel used. Thus the convected heat carried away is greatly in excess of that from a gas-stove. This reduced quantity needs only a small chimney—say, some 3 inches in diameter; and the remainder of the area of the house chimney can be conveniently employed for ventilating purposes by the insertion of a ventilator connected from the top of the room, preferably having mica flaps to ensure an absence of down-draught. This will carry off a large quantity of the heated and foul air from the apartment, and at the same time bring in through doors and windows a fresh supply of pure air. This is especially necessary with a gas-stove, as it does not draw in so much air as a coal fire, owing to the less quantity needed for complete combustion.

If 25 per cent. of the heat has to pass up the chimney, we may profitably inquire into the total heat obtainable from the gas we are burning. This is the more important at the present time, when so many incandescent mantles are being heated. For the purposes of ascertaining the heating value of a gas, a calorimeter is used. This consists of a vessel through which water is made to pass and absorb all, or as much as possible, of the heat from a gas-burner. And here I might remind you that the same heat is given off from an ordinary flat-flame illuminating burner as from a bunsen burner consuming the same quantity of gas. The latter, however, can be placed close to the object to be heated, while the former must be kept away from it, or carbon—commonly known as soot—will be deposited, reducing the heat of the flame, and preventing the proper conduction of the heat, and still further reducing the heat obtainable. These calorimeters are usually of a somewhat elaborate nature, and are perhaps necessarily so when an absolute result in heat units is required. For all practical purposes, a more simple form may be adopted; and I have designed such an apparatus as will give very close approximation to the ultimate results obtainable, and which may be cheaply made and quickly used. It consists of a spiral tube within which the gas burns, a further spiral of tube around which the heated products of combustion pass, and a concentric dome-shaped boiler with suitable inner and outer coverings to direct the products of combustion. The cold water is run into a tank above the calorimeter, where its heat is measured, and passes first through the boiler (entering at the bottom and leaving at the top), then through the outer spiral, and finally through that surrounding the flame, thence through a small box containing the mercury bulb of a finely graduated thermometer, and away to the sink or a suitable measuring vessel. The water is run through the apparatus and the gas lighted; no results, however, are noted until the temperatures of the ingoing and outgoing water are constant.

We will now consider the subject of the "heat unit." It is usually referred to in this country as a British thermal unit, and is the amount of heat required to raise 1 lb. of distilled water through 1° Fahr.—that is, from 39·1° to 40·1°, the point of maximum density of water. It is obvious that we shall require to know three things—the quantity of gas used (hence the simple test meter), the quantity of water heated in pounds (hence the measuring vessel), and the number of degrees that such water has been raised owing to the heat given off by the quantity of gas consumed (hence the use of the two thermometers). To prevent radiation of heat from the water, we try to keep the rise in temperature small by passing a considerable quantity of water through the apparatus, so as to make the difference in heat as little as possible between that of the water and the surrounding atmosphere.

Besides the calorimeter, we have another method of learning the heat values of the gas we may be supplying; but this involves the use of delicate apparatus for obtaining a complete analysis of the different components of that complex body. If, however, we know the proportions of each of these, we can quickly calculate what will be the heat value of the gas; and for this purpose the following table [see p. 801] will be useful.

It has been computed by Mr. Norton H. Humphrys that 15-candle gas gives about 620 B.T.U. per cubic foot, 19-candle gas about 900 B.T.U., and 28-candle gas 950 B.T.U. All these are the absolute and the ultimate heating values. The late Mr. Thomas Fletcher computed, however, that with small pans and kettles we only have an effective heat duty of 150 B.T.U., with the best boiling-burners some 300 B.T.U., and with the best bath-heaters some 600 B.T.U., from a gas giving a maximum of

Heat Units Generated by Complete Combustion.

	B.T.U. Gross.	Per Lb. Net.	B.T.U. Gross.	Per Cubic Foot, Net.	Calories.
Hydrogen (H)	62,535	60,791	326·2	272	34,462
Carbon (C) to CO_2	14,500	12,906	—	—	7,700
Carbon (C) to CO	—	2,495	—	—	1,416
CO to CO_2	4,478	4,234	323·5	—	2,400
Sulphur (S)	4,102	3,916	—	—	—
Sulphuretted hydrogen (H_2S)	4,940	4,420	450·0	403	—
Methane or marsh gas (CH_4)	23,620	21,420	1024·0	919	3,087
Ethane (C_2H_6)	—	—	1764·4	—	—
Propane (C_3H_8)	—	—	2521·0	—	—
Butane (C_4H_{10})	—	—	3274·0	—	—
Ethylene (C_2H_4)	21,713	20,460	1603·0	1510	—
Propylene (C_3H_6)	21,220	19,830	2377·0	2242	—
Butylene (C_4H_8)	20,900	19,700	3921·0	2696	—
Acetylene (C_2H_2)	—	—	1477·0	—	—
Benzene (C_6H_6)	17,780	17,100	3718·0	3574	—
Coal gas (17-candle)	—	16,508	650·0	—	—
Water gas	8,200	7,500	304·0	330	—
Producer gas	—	1,897	160·0	—	—
,, water gas	—	983	—	—	—

Let us take a typical example of (say) 15 or 16 candle gas. Then we shall have—

Hydrogen (H)	=	48·0 p. ct.	× 326·2	= 15,657·6
Methane (CH_4)	=	35·7 ,,	× 1024·0	= 36,556·8
Carbon monoxide (CO)	=	7·8 ,,	× 323·5	= 2,523·3
Benzene (C_6H_6)	=	0·5 ,,	× 3718·0	= 1,859·0
Ethylene (C_2H_4)	=	4·5 ,,	× 1603·0	= 7,213·5
Nitrogen (N)	=	2·5 ,,	(no heat value)	..
			100)	63,810·2
				638·1

660 B.T.U. per cubic foot. From these figures, we see the losses occurring in the domestic use of gas; and we have an indication of the direction in which our thoughts should turn for the improvement of the employment of gas for household use. Mr. Fletcher introduced flat-bottomed vessels with projecting rivets, and with them obtained a duty of 520 B.T.U. per cubic foot of gas consumed, thus saving half the gas; but comparatively little has been done to bring these before the general public, and to educate them in the proper use of gas for heating purposes.

A further point to be observed by users of gas for dometic purposes is to have the burner proportioned to the vessel being used. For greatest economy, the ring should be (say) one-third the diameter of the bottom of the vessel; so that most of the heat will be absorbed under the bottom. By this means a saving of some 30 per cent. may be obtained, though the rate of heating may be somewhat slower, against a ring burner of (say) half the diameter of the bottom of the vessel. Another method of judging the proper size of burner for such work is to use one consuming a cubic foot per hour for each quart of water contained in the vessel. This will boil the water in one hour. If we want to heat the water more quickly, we must use a larger burner and proportionately more gas. When a vessel is required to be kept at a constant heat, the nature of its surface has a great deal to do with the amount of heat lost from it. Thus if it be well lagged, about half of the loss will be avoided, and if polished about one-quarter, as against that lost from a dull black surface as of black iron. Here, again, we see how much heat is lost when an ordinary black saucepan is used on a gas-stove for continuous boiling, and how easy it is to burn our gas in such a way that it is costing much more to the consumer than it need do; and while we are all striving to educate the general public in the proper and more scientific use of coal gas for light-giving purposes, let us not forget that frequently obsolete and unscientific apparatus is also being employed in the other branch of its usefulness—namely, for heating and cooking.

The principles of ventilation are frequently entirely disregarded when gas-stoves are fixed. The flue and hood over the stove, instead of being connected into the chimney of the room or kitchen, are more often than not carried through the wall, and perhaps up a few feet only on the outside. This causes at once a downdraught through the shorter or gas-stove chimney and ventilator, to supply the air required for the larger and higher chimney of the coal-stove.

I should now like to call your attention to the design of bunsen burners, and to point out the details which require attention. First, the issuing of the gas at such a pressure from the nipple as to cause a partial vacuum inside the lower part of the case of the burner, so as to draw in the air to be mixed with the gas through the side holes. In this respect the bunsen burner resembles the steam-injector used for filling boilers with water and also Professor Thomson's water-lifter. These latter have been most scientifically designed so that the steam or high pressure water shall have the greatest effect upon the water; while until the advent of the Kern type of burner, little or no attention had been given to the gas-injector for air, or the bunsen burner. As we have to make a partial vacuum, you will understand that it is necessary to obtain as much pressure as possible at the nipple to secure this. Frequently, however, a full supply of gas with the nipple employed causes too large a flame, so that the hottest part, which is at the extreme edge of the flame, where the gas and air meet and the carbon dioxide is formed, is outside the mantle, and then the supply is turned down by the tap on the fitting—perhaps some little distance from the nipple—and the pressure of the issuing gas is reduced, and with it the good mixture with the air. If a proper nipple for the pressure and the quality of gas, and a governor or governor meter to keep the pressure constant, were employed, the tap could be turned full on, and the maximum pressure obtained at the nipple, with a consequent hotter flame and greater light. As regards a variable nipple, I would call your attention to the steam-injector, where the flow and pressure of steam are not impeded, but the area only of the exit is reduced by means of a tapered screw spindle. This method of reducing the area is only adopted, as far as I know, in the burners of the Humphrey lamp, and is more scientific than anything else I have seen.

[The lecture was illustrated by experiments.]

The PRESIDENT said he was sure the members had listened with the greatest pleasure to Mr. O'Connor's lecture, and had taken a deep interest in the beautiful experiments with which he supplemented his remarks. Heating by gas was becoming so momentous a question, that a lecture upon it was deeply interesting; and it was needless for him to impress upon members the position which gas for heating would occupy in the future. It seemed to him that the money expended on the enrichment of gas by benzol and otherwise might be more properly invested in supplying people with burners. Incandescent burners were tending to revolutionize the consumption of gas. Incandescent lighting had now found its way into the houses of the poorest gas consumers. He asked the members to accord Mr. O'Connor a hearty vote of thanks for coming there to give them the instructive lecture to which they had listened.

Mr. O'CONNOR, in returning thanks, said he was only sorry that his remarks had not raised a discussion. He would like to have heard some of the members who came into contact with gas consumers, say something about their experiences, so that he might know what the public were being told upon the subject of heating by gas. If they had not these experiences to record, let them hope that the next time they met they would be able to tell him that the consumers were being better instructed in the matter of using gas.

Mr. R. WEBSTER (Paisley, late of Granton) read a paper on

GAS AS A MOTIVE POWER.

The author said there were great numbers of processes in existence for making power gas; but the best known could be divided under three main heads: (1) Heating coal in a retort and collecting the products of distillation; coke and coal tar being recovered as bye-products. This method was employed at all gas-works, and was chiefly used for making gas for illuminating purposes, and in a slightly different manner in coke-ovens. (2) By blowing steam into incandescent fuel, with decomposition of the same; the gas produced being known as water gas. There were different modifications of this system; but that of alternate blowing and steaming was invariably used. (3) Producer gas, which consisted of the continuous combustion of the fuel with air and steam, and with decomposition of a little steam in a deep bed of hot fuel; the proportions of air and steam being such that the fire was always kept at a fairly constant temperature.

Of these three systems, the one most extensively in use at the present time for medium or large power purposes was the third, owing to its great simplicity and cheapness. The first system was primarily designed for lighting purposes; but it was also extensively used for power, owing to the low initial cost of the engine and the small space it required; and it was certainly more adaptable for small powers in large towns and congested areas. Though water gas was produced more cheaply than coal gas, it was highly inflammable; and consequently low compressions were necessary when it was in use, and the work obtained from a British thermal unit was less than that from a less inflammable gas of the same heat value. On this account it was very little used as a power gas. In his opinion, the best solution of the question of which was the best gas for engines was this: Coal gas for engines up to a certain limit, or even up to large sizes, where space was a factor, and also where the work to be done was intermittent; but the great future lay with producer gas as a power for all industrial purposes generally, as a high heat efficiency was so easily obtainable.

Mr. Webster went on to say that during the last few years great strides had been made in the use of gas-engines for all classes of work; and owing to the ever-increasing demand, gas managers and engineers connected with the gas industry should foster the knowledge, and be ready at all times to give advice in regard to first cost and upkeep charges, and even prepare plans for the likely user. He would even go further than this, and say that they should also be able to fix the power required, after having had furnished to them the particulars of the various sizes and classes of machines to be driven. At the present time all this was left to the makers of gas-engines, who, no doubt, came very near the mark in regard to the correct size of gas-engines to meet any particular case; but at the same time they could have no idea of the calorific value of the different gases made all over the country. The gas manager knew the calorific value of his own gas; therefore, if he were prepared to give advice to users of it, he could calculate to a nicety the size of engine for any particular case. It would also be convenient for a likely user of gas to consult with the maker of it on the spot, instead of having to send to distant parts for the advice of gas-engine makers. He

saw some time ago, in a newspaper paragraph, that a certain gas corporation in England were going to put in gas-engines of small power for customers, in the same way as gas cooking-stoves were now installed. He had not heard whether or not the undertaking had been a success, but he saw no reason why it should not be. For instance, a cooking-stove costing (say) £4 would probably use 15,000 cubic feet of gas per annum. Taking the charge for gas as 2s. per 1000 cubic feet, the total cost of gas used would be 30s., or about 37 per cent. of the cost of the stove. A gas-engine costing £70, and giving 12 indicated horse power, would use 432,000 cubic feet per annum, taking 300 working days at 10 hours per day; making the annual cost of gas £43, or 61 per cent. of the cost of the engine. This showed that the money returned for the use of the engine was about 24 per cent. in excess of that returned for the stove, in the same proportion. At the present time, however, he did not think it would be good policy for gas undertakings to embark on this venture, for it was a fact that so largely had producer gas been adopted in the Midlands, that the Birmingham Gas Committee had been obliged to recommend a further reduction in the rates to users of power gas; showing that the Committee fully realized the serious situation likely to follow the general employment of producer gas in the district.

The circumstances just alluded to afforded a striking example of the risks to which municipal traders might be sometimes exposed; and therefore it behoved gas companies to look round, and try by every means in their power to cheapen their gas, so as to compete with producer gas for power purposes. In great measure he thought this would be shortly achieved; for he noticed that parliamentary powers were now being sought to enable gas companies to reduce the illuminating power of their gas, thanks to the invention of the incandescent mantle. When this was done, a greater heat efficiency would be the result, making the gas very suitable for power purposes. He did not know whether any of the members had ever experimented with producer gas, by using it, after it had been purified, as a lighting agent. If so, he should very much like to have particulars, as he had often thought of trying it himself, but the want of time and opportunity had prevented him. He should not be at all surprised if it turned out to be a very fair success. Producer gas as at present made was not cleansed in any way—an omission that might have to be made good for the purpose of avoiding injury to the cylinders and working parts of the engines in which it was employed. He had an idea that if some simple means of purifying the gas were adopted, it would become a serious stumbling-block to the manufacturers of lighting gas; for it stood to reason that if the owners of (say) a large factory had producer gas installed for power purposes, they would naturally use it for lighting, if they could do so.

Notwithstanding what he had said in regard to the advantages of producer gas, there would still be a large increase in the numbers of gas-engines to be worked with coal gas; and those would be used for generating electricity both for power and light, more especially in important towns where they had innumerable large shops and warehouses. For instance, in Edinburgh, he knew of places where they now took their electricity for power and lighting from the Corporation; and he presumed they also paid their bills, which must be large ones, to the department. Now, if these people could only be persuaded to put in a gas-engine and motor for their requirements, and pay their bills into the Gas Department of the Corporation, he was positive they would find them greatly reduced. He did not think he should be very far from the mark when he said they would find the reduction nearly 50 per cent.; but probably this was where the flaw occurred in municipal trading—the offering of competitive commodities. It would look very much better, too, if corporations used their own gas to generate electricity; but he supposed steam was mostly used. It therefore behoved gas companies to enter into the arena; for what was the whole thing but competition? And it seemed to him that the users of electricity would be their best customers if they could show them the advantages of gas as a power to generate it. By the use of electricity, nothing was lost to gas companies; for if the gas were not used for direct lighting, it would be employed to give light indirectly, through supplying power to drive motors which produced light, and not only light but also a power, which could be used for no end of purposes in large towns. He did not know why corporations could not supply electric power cheaply; but it was the rule that they could not. He supposed great expense was incurred through having to pay interest on capital expenditure, upkeep charges, and so on; but he was afraid the real cause was that competition was not keen enough. The firm with which he was connected had decided to increase their horse power by 100; and as they were rather confined for space, they approached the Corporation and asked their charges for the supply of electric power. This was given, and it amounted to £1000. Knowing this, it was determined to look out for a corner for the purpose of putting down a gas-engine and motor. On going into the details of the cost, they found that they could generate their own electric power at less than half what the Corporation could supply it for—viz., £400, in which figure was included the wages of a stoker and an electrician, and 5 per cent. on the capital charges. At the present time, therefore, they were not quite decided whether it should be gas or steam power; the drawback to the latter being want of space. He thought the decision would be for gas power.

To run a 100-horse power coal-gas engine for one year of, say, 300 working days of 10 hours per day, would cost £350 for gas. The same size producer-gas engine would cost £180 for fuel; while the same size steam-engine would cost £200 for fuel; and to use some corporations' electricity would cost £800. In these calculations, he had assumed the price of coal gas to be 2s. per 1000 cubic feet, and the price of steam coal 10s. per ton. Coal-gas engines had advantages over both, and these were—(1) Small initial cost. (2) Small space occupied. (3) No flues to clean. (4) No smoke. (5) No stoker. (6) No regular attendant. (7) No coals to cart or ashes to remove. (8) Small quantity of water required. After 70-horse power was reached, these advantages went for little as against the great saving in money for fuel costs.

Discussion.

Mr. J. R. MOYES (Edinburgh) said he had noticed an article in the "Gas World" that day on the point Mr. Webster had referred to—the lighting power of producer gas; and, from what he could see, the expense incurred in purifying this gas would be more than it was really worth.

Mr. WEBSTER said he should follow the matter up, and experiment with purified producer gas as a lighting agent.

Mr. H. RULE (Falkirk) thought Mr. Webster had made out a very good case for the coal-gas engine. Like Mr. Webster, he fully realized that if coal gas were to be used for power purposes, gas managers must be up and doing. The first step to be taken was to get a reduction in the illuminating power, to enable them to compete with producer-gas plants. A 15-candle power gas would have to be made, and sold at about 1s. 6d. per 1000 cubic feet. Then, he believed, the advantage would be all on the side of the coal-gas engine. The heat value of a 15-candle gas was about 600 B.T.U. Producer gas only gave from 200 to 250 B.T.U. If this were the case, they would not get the same efficiency; and the result would be that they would have to use far more of the producer gas. In this gas there was a large percentage of nitrogen; and, as they all knew, this was inert, and did nothing at all. If they could get coal gas cheap enough, there was no fear of its being used for power purposes. He had had some experience in working with electric power, and had come to the conclusion that it was very handy; but it required to be supplied very cheaply—in fact, at about ½d. per unit—before it could compete at all with the gas-engine. This was his experience within the last few months.

Mr. J. R. PHILIP (Edinburgh) asked if producer-gas engines worked satisfactorily in large sizes.

Mr. WEBSTER said this was the very point with the engines alluded to. They were made in large sizes, and were the coming motors; but for small sizes the coal-gas engine was the thing. At present, they were making engines up to 1000-horse power, to be worked with producer gas. As to the actual results, he would not like to say anything; but up to 300 or 400 horse power there was no doubt that engines worked with producer gas were the right things. But, as he said in his paper, the worst of producer gas was that it was not cleansed in any way; and therefore it might cause injury to the cylinders and working parts of the engines. Of course, as the gas was in its infancy, this defect would most probably be remedied. In regard to the supply of electricity at ⅜d. per unit, he thought they would almost require to supply it at ¼d. to compete against them.

Mr. RULE said he mentioned ½d. as the maximum.

The PRESIDENT said the paper to which they had just listened brought once more to their notice the pressing need there was for a cheap power gas, supplied from the town mains. In comparing gas-engines with electric motors and oil and steam engines, probably the greatest advantage the former could claim was over the electric motor. There were, however, independent of all figures, sometimes exceptional circumstances which must determine the class of prime mover to be installed; and these must be gone into before deciding on the means to be adopted. The cost varied with the price of the gas available, its pressure, calorific value, and the efficiency of the gas-engine; and Mr. Webster, in his paper, recommended gas engineers to study the matter of fixing the power of these engines after particulars of the various sizes and classes of machines to be driven had been obtained, as gas managers would then be much better able to do this than anyone else, knowing the calorific value of the gas to be used. All over, however, it was impossible to blink the fact that suction gas would prove a very serious competitor with coal gas at the present cost of the latter; and this had been shown in a very decided manner in the case referred to in the paper. The idea of Mr. Webster regarding the use of producer gas as a lighting agent would, no doubt, appeal to some of the members; and it would be interesting to have their views on the matter. The chief obstacles to this idea would be the large percentage of nitrogen, which possessed no power value, that would be set free after the oxygen of the air had united with the carbon in the coke to form carbonic oxide and carbonic acid, which latter was also a gas of no power or heating value, but cooled the flame. Therefore the carbon dioxide would have to be removed, as, though it might be permissible to allow the small percentage in coal gas to remain, where there were no hydrocarbons to make up the deficiency it would be a different matter; and the percentage of carbon dioxide in producer gas was much higher than in coal gas. They were much indebted to Mr. Webster for his paper, compiled under difficulties, owing to which, however, it had not suffered in value.

THE RECENT VISIT TO THE DUNDEE GAS-WORKS.

The PRESIDENT remarked that the members would have observed in the "Notes from Scotland" in the last number of the "JOURNAL OF GAS LIGHTING" a reference to their visit to the Dundee Gas-Works. He would ask Mr. Simpson, of Inverkeithing, to give his version of the affair; but, in the meantime, he would read a letter from Messrs. A. M. Fyfe and W. Mitchell, of the Dundee Gas-Works. [The letter stated that the visit was not an official one of the Association, and asked that the paragraph should be corrected.] The President went on to say that he did not think any of the members who went to Dundee would have cause to regret it; and they would go back again, if the Association went.

Mr. J. SIMPSON said it was a private arrangement between Mr. Mitchell and himself. They went on a purely unofficial visit; and Mr. Yuill understood that they were coming in a strictly private capacity, and not as an Association. It was stated that he thanked Mr. Yuill in the name of the Association; but he certainly did not do that, but on behalf of the members who were there.

Mr. J. R. MOYES said he had a copy of the "Dundee Advertiser" sent to him, with the paragraph marked, and when he saw it he did not know what to say.

A MEMBER remarked that the thing was arranged for in a railway carriage as they were going home from Falkirk.

Mr. MOYES pointed out that no one objected to the visit, but to its being put in the name of the Association.

The PRESIDENT said that was so; but who authorized it to be put into the Dundee newspapers, he did not know.

Mr. MOYES, after further discussion, proposed that the paragraph should be contradicted, and that it should be stated that a few members of the Association paid a private visit to the Dundee Gas-Works.

Mr. W. BLAIR (Edinburgh) moved, as an amendment, that no notice be taken of the matter.

On a vote being taken, 13 voted for the motion, and 5 for the amendment.

LABOUR-SAVING APPLIANCES IN GAS-WORKS.

At a Recent Meeting of the Liverpool University Engineering Society, a paper on "Labour-Saving Appliances in the Carbonization of Coal" was read by Mr. H. E. BLOOR.

The author began by remarking that the title of his paper covered so wide a range of subjects that he would only be able to touch upon many of the features of gas-works practice in the mechanical handling of material. Moreover, many of the conveyors, &c., largely used by gas engineers were common to a great variety of applications. These would therefore be passed over without any attempt at detailed description. He then proceeded to describe a setting of retorts, and explain the system on which it is heated; and this led him to the subject-matter of his paper. He characterized the economical handling of coal and the coke resulting from its carbonization, as the gas engineer's transport problem. Coal had, he said, to be received, stored, placed in the retorts, and carbonized; while the residual coke had to be withdrawn from the retorts, removed from the retort-house, screened, stored, and loaded into carts, waggons, or barges. He then went on to direct attention to the appliances by which these operations are performed. He pointed out that the coal having been duly weighed, its lumps have to be reduced in size by means of breakers, consisting of claw-teeth made of cast steel, and mounted on shafts which gear together and draw down the coal—breaking the lumps in so doing. The breaker may be conveniently mounted over the first elevator boot in the system. The coal may be conveyed by any suitable band, push-plate, or bucket conveyor; the first-named arrangement being the one in most general use for putting the coal into the store. The hoppers over the working floors of the retort-houses are of two classes—viz., those which are continuous throughout the length of the house, and those which are of large size and placed centrally or at the end of the building.

Having brought the coal to a suitable position over the working floor, the author described the operation of charging the retorts by means of West's manual stoker. Turning to the power-driven machines, he explained that they are of three kinds. By the first, the charge is pushed into the retort in instalments; by the second, a scoop is charged with coal, run into the retort and turned over; and by the third, coal is projected or shot into the retort. The Arrol-Foulis machine comes into the first category. It is made continuous with the retort bottom by means of a trough, into which a measured portion of the coal is dropped. A push-bar carrying a ram-head, and actuated by two hydraulic cylinders, is then set in motion, and pushes the charge into the retort. Six portions make a charge for half a 20-feet retort; so that two machines are required for a house. West's machines belong to the second, or scoop class; and power is supplied by compressed air motors working at a pressure of 60 lbs. to the square inch. No part of the charger touches the bottoms of the retorts. The projector machines embody an entirely new principle, inasmuch as, instead of the coal being placed in position by a portion of the mechanism which enters the retort for the purpose, it is thrown into the retort; the layer being kept of uniform depth by a reduction in the velocity of the machine. The author described in detail the De Brouwer and Toogood chargers; and he pointed out that the projectors may be slung from overhead rails and fed from continuous hoppers, or be carried in a framework having a large top storage hopper, and running on rails laid on the retort-house floor.

The coal having been carbonized, the author next dealt with the several appliances used for removing it from the retorts. These are of two kinds—pullers and pushers. The former, which are the older type, closely follow the movements by which retorts are drawn by manual labour. The special features of the West and Arrol-Foulis dischargers were indicated, and the author pointed out that, as they work only half of a 20-feet retort, two machines are required for each house. With regard to pushers, he mentioned that as the great point urged in favour of projectors is that one machine is capable of dealing with a full-length retort, a similar advantage may be claimed in connection with the drawing operation. Mr. Bloor remarked that practical questions—such as the behaviour of coke in retorts which have lost their original even bottom—have still to be decided; as these machines have no records of work such as those of the older type can show. He described the De Brouwer discharger. The pusher-bar here is formed in three lengths, of which the first is a rack, of coarse pitch, on the under side; the other two lengths fitting telescopically each over the interior pieces; and the rack is continued in the form of a sliding link chain. He characterized this machine as very ingenious, as, he said, was also that designed for use with the Toogood charger, consisting of a telescopic ram in two or three lengths, extended and shortened by a system of internal ropes and pulleys. He pointed out that the West Gas Improvement Company have designed a combined machine in which the charger and discharger are mounted on one framework, and all the levers are under the control of one operator. The De Brouwer charger and discharger have been similarly treated by Messrs. Jenkins. In each case the aim has been to decrease the amount of labour required, and permit of the machines being operated at a profit in small works.

The author next described the Fiddes-Aldridge machine, which he said embodied an advance in principle, as the operations of charging and discharging retorts are effected simultaneously by one appliance. Mechanically, it might be regarded as a combination of the Arrol-Foulis charger and the Jenkins and De Brouwer discharger. He indicated the chief features of the machine as follows: It is made continuous with the retorts; and as the ram enters, coal is dropped into the spaces, being carried forward by the pusher-plates. The ram-head then pushes out the coke; and when the journey is completed, the ram is withdrawn. The swinging doors gently smooth off the heaps of coal as they slide along, leaving the coal in a very even layer. The ram-head is followed into the retort by a framework, which consists of two side-plates separated by distance-pieces, which act as hinges for the pusher-plates, which are free to swing back as the frame leaves, but are stopped by a pin, and held rigid on the forward movement into the retort.

The subject of the conveyance of coke was next taken up. He explained that conveyors run along the front of the retort-benches, and that as the coke is drawn, it falls into the trough and is quenched with sprays of water. As a rule, conveyors are continued in an inclined direction after leaving the gable end of the retort-house, by which means a considerable storage area is fed direct from one conveyor, and there is a minimum of complication. The inclined end of the conveyor usually delivers into a screening-machine, consisting of an inclined perforated sheet-iron cylinder mounted in bearings and slowly revolved. Storage hoppers are provided to catch the various sizes of coke, and from them carts and waggons are readily filled. Coke dust is a great enemy to bearings, more particularly in the special circumstances of heat and moisture occurring in the retort-house. In the design of conveyors, therefore, every effort is made to guard bearings as much as possible from the encroachment of dust, and to minimize its effect by making the bearings as long and as few as practicable. The author pointed out the characteristic features of the conveyors made by the West Gas Improvement Company, Messrs. Graham, Morton, and Co., the New Conveyor Company, and Messrs. Robert Dempster and Sons. He explained that the West conveyor consists of a heavy chain running in a trough. It is composed of block links carrying projecting arms, and of side connecting links—a very long bearing being obtained. Messrs. Graham, Morton, and Co. prefer to carry the coke, rather than draw it along the bottom of a trough. Their conveyor is thus a continuous belt of perforated plates or gratings, each belt consisting of a series of hinged pieces carried by rollers. All surplus moisture has a free escape from the coke; and consequently there is no danger of the latter becoming water-logged. The conveyor of the New Conveyor Company is composed of separate sections of plate, on the same principle as in the conveyor just described, but differing in detail. On the return journey, the plates present a flat surface on the under side, and this surface is carried by suitable rollers. Any small coke which may fall into the trough is moved forward by push-plates, so that the several roller bearings are almost entirely protected from dust. The tip-bucket conveyor devised by Mr. Toogood, of Messrs. R. Dempster and Sons, is circular in cross section, and has circular end plates. Tips on either side of the bucket overlap, and thus automatic loading gear is avoided. The tipping operation is effected by means of a travelling carriage

provided with small rails that engage with the circular ends of the buckets, and cause them to revolve as the chain proceeds. Though not coming within the scope of the paper, the author at this point described an ingenious device applied by Mr. Toogood to equalize the strain on the chains of conveyors.

In conclusion, Mr. Bloor expressed his thanks to those who had assisted him in the preparation of his paper. All the firms to whom he had applied for information had readily given it; but his special thanks were due to the West Gas Improvement Company and to Messrs. Jenkins—the former having lent him a fine collection of slides, and the latter some slides and a model of the De Brouwer machine. He said the preparation of the paper had been a pleasant task; and he expressed the hope that it might be of interest and possibly of some value.

It only remains to record that the paper was fully illustrated by lantern views, and was followed by a good discussion, in which Professor Watkinson (who presided), Mr. E. Allen, the Engineer and Manager of the Liverpool United Gas Company, and Mr. S. Tagg took part. In the course of his remarks, Mr. Allen stated that hand labour in the retort-house cost 3s. per ton of coal carbonized, against 1s. 4d. per ton with machines. He also mentioned that the Fiddes-Aldridge machine was working very satisfactorily at their Wavertree station.

PREVENTION OF SMOKY FOGS.

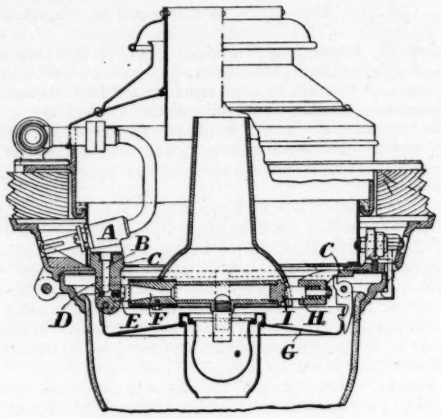
It may be remembered that at the conference on the subject of smoke abatement held in London in December last, a paper was read by Mr. Arthur J. Martin, Assoc.M.Inst.C.E., &c., on "Smoke Prevention and Coal Conservation." An abstract of the paper was given in our report of the proceedings on the occasion; and it is again referred to mainly to mention that the full text has now been issued in pamphlet form—under the title of "How to Prevent Smoky Fogs"—by the Sanitary Publishing Company, Limited. The principal feature of the paper was the author's proposal to supply London with gas piped from generating-stations in the Yorkshire coalfields; and he submitted a proposition to the effect that, "in view of the need for husbanding our coal resources, the deplorable and increasing evils produced by smoky fogs, and the necessity for providing a cheap smokeless fuel for domestic and industrial use, the Councils of the Royal Sanitary Institute and the Smoke Abatement Society be asked to join in a memorial to His Majesty's Government setting forth the urgency of these questions." The motion was carried without opposition; and in a postscript to the reprinted paper, Mr. Martin offers a few remarks in regard to it. He says that both in the course of the discussion, and subsequently, an impression was manifested that the object of the resolution was to promote legislation in support of the proposals before the conference. Although it was fairly clear from the paper itself that this view of the object of the resolution was quite a mistaken one, he thinks it may not be out of place to explain it a little more fully. He says it should be borne in mind that, whether we like it or not, fresh legislation on the subject is bound to come, if not in the shape of express enactments, at least in the form of clauses to Bills promoted by gas or electric companies, municipalities, and others. Such clauses, if drafted by the promoters, may invest them with powers which it is not to the public interest that they should possess. If inserted at the instance of the opponents, they often seriously curtail the utility of the Act, or increase the cost of the commodity to be supplied. Such clauses are, moreover, apt to be taken as precedents, and their influence is thus far-reaching. In the parliamentary fight over an important Bill for the supply of lighting or power, all interests are ably represented, with the one exception of the consumer's, with the natural result that only too often he has to pay, in the shape of enhanced cost or impaired service, or both, for "soothing the susceptibilities of the contending parties." Mr. Martin says it was for the sake of protecting the consumer, and because it seemed eminently desirable that long views should be taken in dealing with all measures which relate to the supply of power, the consumption of coal, or the utilization of the bye-products therefrom, that he proposed the resolution.

REGISTER OF PATENTS.

Inverted Incandescence Gas-Lamps.—Imray, O.; a communication from Julius Pintsch, of Berlin. No. 3876; Feb. 24, 1905.

This invention has for its chief object to secure a ready accessibility to all parts of the lamp—and particularly to the gas or vapour nipple and the lamp-mantle—for the purpose of adjustment, cleaning, or replacement.

In the lamp illustrated, the gas is admitted by a pipe having a flanged connection A with a hole or passage B in the rim of the supporting ring C. The nipple socket D is rigidly connected with the passage B, and projects downwardly therefrom; so that the nipple E, which is screwed into the socket wall, is directed horizontally. The bunsen tube F, and also the reflector G, are pivoted to a downward extension of the nipple socket; and the bunsen tube is normally secured coaxially with the nipple by a spring-urged stop or plug H mounted in a depending bracket carried by the supporting frame. The plug may be used to close the end of the bunsen tube, or the tube may be closed by a screw plug I, which is suitably recessed on the back for co-operating with the plug H.



The burner extends downwardly from an intermediate point of the bunsen tube, into which it is screwed so as to be central in the case of a single-burner lamp; the arrangement being suitably modified for a multiple-burner lamp.

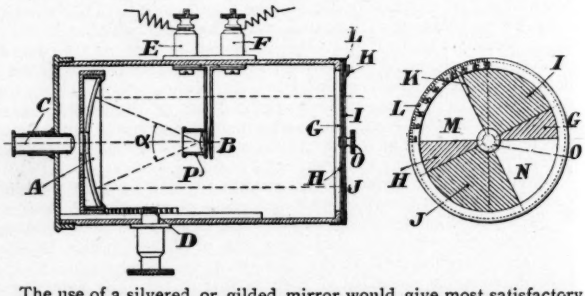
By providing an adjustable sleeve on the bunsen tube (by which the air inlet may be regulated), the same fittings may be used for different candle powers by the simple substitution of different nipples and, if necessary, different burners.

The reflector has a central flanged opening with an inwardly projecting lip, which serves to support the mantle chimney or protector by its rim; and an annular cup or ring is frictionally mounted on the flange, thereby securing the mantle chimney or protector. It is provided with an inwardly projecting flange, which supports the mantle; the latter being secured in the support or carrier by such suitable means as a spring ring.

Measuring High Temperatures.—Spooner, A. F.; a communication from La Compagnie pour la Fabrication des Compteurs and Matériel d'Usines à Gaz, and Fèry, C., of Paris. No. 5668; March 17, 1905.

This invention is particularly directed to apparatus of the type referred to in patent No. 18,382 of 1904, which comprises what is generally called a thermo-electric telescope and a recording galvanometer—the former consisting of a mirror adapted to be focussed on an aperture in the wall of the furnace whose temperature is to be ascertained, and a thermo-electric couple upon which the mirror concentrates the caloric rays issuing from the aperture, and thus produces a current which flows to the galvanometer.

The only theoretical law that can be applied practically for the measurement of very high temperatures is (the patentees remark) that of Stefan, which reads as follows. "The amount of heat radiated by a black body, or by a furnace, the opening of which is small as compared with its size, to another black body, is proportional to the difference of the fourth powers of the absolute temperatures of the two bodies in question." The interposition of a concentrating apparatus, lens, or mirror between these two bodies is indispensable, in order to increase the amount of heat to be measured; and experience has shown that the lenses, even when made of the most transparent refrangible body known (rock salt or fluorine), produce an absorption whose law has not yet been determined—preventing the extrapolation of the graduation of apparatus marked for low temperatures.



The use of a silvered or gilded mirror would give most satisfactory results, the specification continues, if it were possible to provide it with a diaphragm or shutter for varying its surface progressively without damaging the independence which the indications of the apparatus must have with regard to the distance between the latter and the furnace. The arrangement of such a diaphragm or shutter forms the subject of the present invention; and "it admits, when the telescope is marked for a single low temperature, of obtaining the indications it will furnish for temperatures as high as desired—the indications being brought within the scale or range of the galvanometer by decreasing the working opening of the diaphragm or shutter."

The illustration shows a longitudinal section of a telescope provided with such a diaphragm or shutter, and a front view of the diaphragm detached from the telescope.

As described in the 1904 patent, and as indicated in the present illustration, the telescope comprises a silvered or gilded mirror A, which concentrates upon the soldered joint of a thermo-electric couple B the caloric indications emitted by the body whose temperature it is

desired to obtain, and towards which it is directed. An ocular C assists the focussing, which is effected by varying the distance of the mirror from the soldered joint of the couple by means of a rack and pinion D. Two terminals E and F collect the electric current produced by the heating of the soldered joint, and convey it to the galvanometer.

The required independence of the indications of the apparatus with the distance accrues owing to the angle α of the cone of rays concentrated by the mirror at the bottom of the small tube P (which contains the thermo-electric couple) being independent of the distance from the concentrating mirror to the couple itself. It will thus be understood why it is impossible to employ an iris diaphragm or shutter in this apparatus.

The diaphragm or shutter, which forms the subject of the present invention, is composed of two fixed sectors G and H and two movable sectors I and J turning together on an axle O. The movable sectors are provided with an indicating pointer K, adapted to move over a circular scale L, and so permit of the measuring of the angle of the resulting sectorial open regions or spaces M and N, which angle can vary from 90° to 0°.

The telescope being directed fully open—*i.e.*, when the angle of the parts M and N is 90°—on to a furnace where (say) silver has reached its fusing point of 962°, the same deviation is obtained on directing the apparatus on to a furnace containing (say) platinum for an angle X, so that one has—

$$90° \ (2{\cdot}32 - t^4) = x \ (17{\cdot}9 - t^4);$$

2·32 and 17·9 being respectively the fourth powers of the absolute temperatures of fusion of these two metals expressed in thousands of degrees, and t^4 the fourth power of the temperature of the soldered joint—viz., 0·0086—which can be left out of consideration. Therefore this obtains—

$$x = \frac{90 \times 2{\cdot}32}{17{\cdot}9} = \frac{208\,8}{17{\cdot}9} = 11\,6°,$$

which is the angle the pointer K should indicate on the scale L.

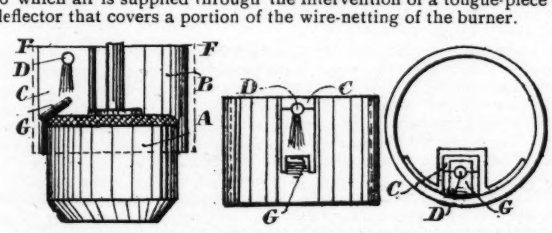
This method of reducing the sensibility is said to be the only one that can be employed, because, while the introduction of a resistance into the circuit of the galvanometer will reduce the sensibility, it will not prevent the excessive heating of the soldered joint of the thermo-electric couple, which might then fuse. If, in fact, one supposes 40° of rise of temperature for the soldered joint directed on silver in fusion, for instance, one would find, in directing this same soldered joint on to (say) platinum, this—

$$\frac{40 \times 17{\cdot}9}{2{\cdot}32} = \frac{716}{2{\cdot}32} = 308{\cdot}6°,$$

an excessive temperature capable of deteriorating the couple, and for which the proportionality of the indications no longer exists.

Self-Lighting Gas-Burner.—Theuerkorn, O. P., of Chemnitz, Germany. No. 8901; April 27, 1905.

Automatic gas-lighters of the class in which the "igniting pill" is arranged over the burner have the objection that, owing to the position of the pill within the range of the flame, it becomes coated with carbon, and is also affected by the great heat; and it is the object of this invention to obviate the objection by disposing the pill below the top of the burner, and therefore below the flame, by providing a depression or chamber in a separate burner-ring to receive the pill, and to which air is supplied through the intervention of a tongue-piece or deflector that covers a portion of the wire-netting of the burner.



A separate metal ring B is placed over the burner A, and in a channel-shaped chamber C formed in its wall at one side is fixed the igniting pill D; the open channel thus formed allowing free access of the external air to the igniting pill. To prevent the gas from the burner ejecting the air from the chamber, and so preventing the igniting pill becoming active and rendering the platinum wires incandescent, there is a deflector G that projects sideways into the chamber C and, covering a portion of the metallic mesh of the burner-head, deflects the gas-current along the inner part of the chamber.

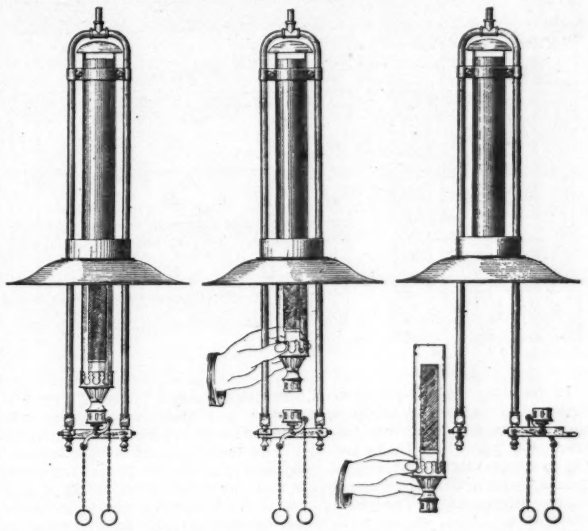
When the gas-tap is opened, some of the gas enters the space C above the tongue G and mixes with the air surrounding the igniting pill, whereby the latter is brought to incandescence, and the gas itself ignited. The flame is, however, as yet confined within the space C close over the burner; but as the point of the flame reaches upwards where the gas ascends from the ring-space B, it lights the gas. The main flame then renders the mantle incandescent, and takes its seat on the upper edge F of the ring; being unable to descend into the latter, as no air is supplied to the interior. At the same time, the main flame draws the ignition flame from the chamber C upwards over the edge F, where it remains by reason of the cold-air current created in the chamber above the deflector G. The continuous cold-air current thus cools the ignition pill and extinguishes it.

Incandescent Gas-Lamps.—Collett, A. E., of Leeds. No. 11,834; June 6, 1905.

This invention relates to the class of incandescent gas-lamps in which the lamp-frame, composed of metal gas-tubing, is provided with a metallic extension chimney above the mantle-protecting glass chimney or globe carried on the gallery of the burner; the extension chimney having the effect, on the lamp being lit, of feeding the flame with an increased quantity of air, whereby "a powerful incandescent light is produced."

In such high-power lamps as hitherto constructed, difficulty has at times been experienced in removing the burner for the purpose of renewing the mantle or otherwise attending to the lamp; and it is the object of the present invention to construct or arrange a high-power lamp in such a manner as to "enable the burner to be removed and replaced with facility—and this without endangering the mantle."

To this end, the lamp-frame may be composed of metal gas-tubing; but instead of making the lower part of the frame, which carries the burner, continuous or in a piece with the vertical members of the frame, the lower cross member of the frame is formed separate from the vertical members, and the cross member is pivoted to one of the vertical members, so that the cross member is capable of being turned inward on its pivot into position with its free end engaging the lower end of the other vertical member, or be turned outward away from it, at will. The cross member carries at its centre the burner-fitting, to which gas is supplied by one of the vertical members and a gas-way formed in the cross member; or, if desired, it may be supplied from one of the vertical members to the central gas-fitting by a short length of flexible tubing.



In the case of a lamp in which the burner carries an ordinary mantle-protecting glass chimney, the extension chimney above the latter may be stationary or fixed in the lamp-frame; and when it is required to remove the burner, the latter is lifted vertically (and with it the mantle and glass chimney) off the burner-fitting located on the cross member of the lamp-frame, and passed up within the extension chimney a short distance. The cross frame is then turned or swivelled outward on its end pivot, so as to leave the lamp-frame perfectly open at its base; and afterwards the burner and its mantle and chimney are lowered through the space so formed, without in any way disturbing the extension chimney of the lamp. After the burner has been attended to, it is again passed up vertically within the extension chimney, and the cross member swivelled round into position to receive the burner, which is then lowered.

In the case of a lamp in which the burner carries a globe around the mantle, the extension chimney may be arranged to slide vertically in its frame; so that on the burner being lifted off its base member, the globe carries the extension chimney up with it a short distance until the base member of the frame is swivelled outward. Then, on lowering the burner out of its frame, the extension chimney comes down and rests on a suitable stop, which limits its downward movement.

The accompanying illustration will sufficiently explain the invention without further details of construction being given.

Air and Gas Passages of Regenerative Furnaces, and Tiles for use therein.—Brown, J. H., of Nottingham. No. 20,317; Oct. 7, 1905.

This invention relates to the construction of the gas and air passages of regenerative furnaces, and the tiles for building the vertical division walls of the passages.

Fig. 1 [p. 806] shows a projected view and cross section of three tiles. Fig. 2 is a cross section of a part of the gas and air passages of a regenerative furnace, built of tiles A and C of fig. 1. Fig. 3 is a sectional elevation on the line X. Fig. 4 is a cross section of a part of the gas and air passages of a regenerative furnace constructed of tiles B and C of fig. 1. Fig. 5 is a sectional elevation on the line Y.

The tiles A, B, C have a ribbed panel P on one face, so as to reduce the thickness and weight of the tiles and the thickness of the division walls, without reducing its strength, and to give more flue-space, and consequently slower travel in the passages of the waste gas and secondary air. The two top corners of each A tile are rebated on the panelled face, and the middle part at the bottom is also rebated; so that when the tiles are placed together (see figs. 2 and 3), the three rebated parts form a recess for receiving the end of an ordinary fire-brick D—the other end being built into the side wall or furnace wall, forming a strut to keep the walls at the proper distance apart. The cross bricks D become heated by the waste gases in the passages, and give up their heat to, and split up, the incoming gas and air.

Each B tile has all its corners rebated; and when four of the tiles are placed together (see fig. 5), the four rebated corners coming together form recesses for receiving the ends of cross strut-bricks D.

Fig. 1.

Fig. 2.

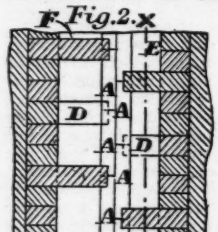


Fig. 3.

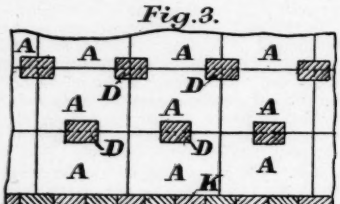


Fig. 4.

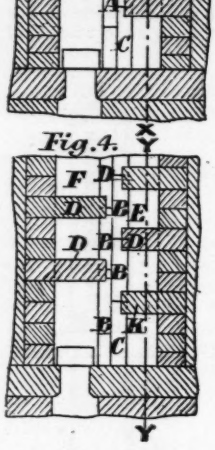
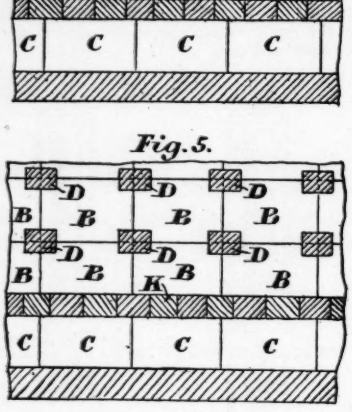


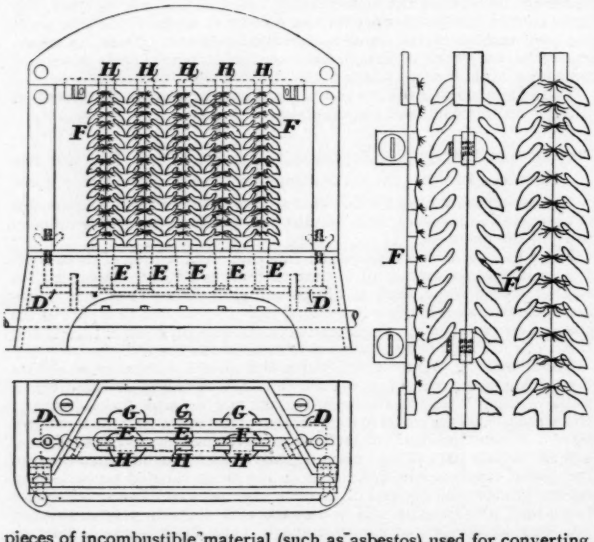
Fig. 5.



In building the air-passages E and gas-passages F, the C tiles are first laid in course end to end (see figs. 2, 3, 4, and 5), forming a continuous rebate for receiving the ends of the cover bricks K of the bottom flue. On top of the C tiles are laid, in courses, the A or B tiles, according to which method is adopted (see figs. 2, 3, 4, and 5), and the cross bricks D are laid in the rebates; so that there are cross bricks D and spaces alternately. The lowest row of A (or B) tiles which lies upon the row of C tiles, should have a corresponding continuous rebate on its lower edge for receiving the ends of the row of cover bricks K. In the wall between the air-passage E and the gas-passage F, the ribbed tiles A or B are built back to back (see figs. 2 and 4), and are so arranged that the joints of the tiles in one course miss the joints in the other, so as to prevent bye-passing of the gas and air from one passage to the other.

Gas-Stoves.—Woodall, H. W., of Wimborne, and Duckham, A. M'D., of Upper Parkstone. No. 20,873; Oct. 14, 1905.

One feature of this invention relates to a device for regulating the air admission to gas-stoves—by mounting the burner-tubes on a piece that is independent of the burner-nipples and that can be raised and lowered relatively to the nipples, so that the space available for the intake of air at each burner may be varied for all the burners by a simple adjustment. Another feature relates to the means whereby the



pieces of incombustible material (such as asbestos) used for converting the heat of the burning gases into radiant heat are held—by deflectors (serving to deflect the heat upon them) of special construction designed to render them efficient and to facilitate their intrcduction into, and removal from, the stove.

The stove consists of a framework, through the lower part of which extends the gas-pipe fitted with nipples. Above the gas-pipe, and parallel with it, is a bar or plate D, which is adjustable in a vertical plane by wing nuts working on screw pins fixed to the plate and extending through perforations in a horizontal member of the framework. The bottom surface of the plate D is curved and countersunk and perforated at the part above each nipple. A burner-tube E is screwed into each perforation; and to ensure that the burner-tubes and nipples shall remain in register, vertical pins, screwed into the gas-pipe, extend through perforations in the plate. By adjusting the winged nuts, the plate can be raised or lowered until the space between the nipples and burner-tubes "is that best suited for admitting the required proportion of air to the latter."

The deflectors F are made of iron or other suitable material, each in two parts, each part having a straight edge and one or more perforated lugs. The other edge is serrated in the manner shown. The straight edges having been placed together with the asbestos fibres between them, screw bolts are passed through the lugs; and the two parts are thus securely held together. Each deflector has top and bottom lugs; the former being inserted into a slot H in an upper cross bar of the framework, and the latter then dropped into a slot G in the lower plate.

Vertical Gas-Retorts.—Woodall, H. W., of Wimborne, and Duckham, A. M'D., of Upper Parkstone. No. 21,447; Oct. 21, 1905

This vertical retort arrangement is described elsewhere to-day—see p. 789.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by Correspondents.*]

Purification Results at Chester and Stretford.

SIR,—If you will permit another occupation of your space, allow us to say that only by the use of your columns was it possible for us to direct attention to the disparity between the results secured by the "Jäger" grids at Chester and those referred to at the Manchester meeting—as, in consequence of the custom excluding manufacturers, we were unable to be present at the discussion.

The figures given in our letter, however, speak for themselves, and certainly confirm our contention that the Jäger system is superior to others.

Millwall, March 16, 1906. SAML. CUTLER AND SONS.

Notes on Gas-Fires—From an Official's Standpoint.

SIR,—In the "JOURNAL" for March 6, Mr. Leeds wrote: "It is a well-known fact that many a physician looks with unfavourable eyes upon a gas-fire of any kind." . . . "He looks around for a scapegoat." . . . "Without the leisure to investigate the true cause, he offers up the gas-fire as a sacrifice." Again, Mr. J. H. Brearley, at the Manchester District Institution of Gas Engineers' meeting, said: "But without taking or initiating tests personally, we often find medical men perpetuating the idea, which we know to be false, that electricity is healthier than gas for living rooms."

I know that practitioner—"He comes from Sheffield." Distressed consumers, in reproachful tones, have given my wearied ear narrations of the astonishing things he has told them about gas-fires—fires as innocuous and serviceable as the distilled water of his own prescriptions. What he said was neither true, new, nor indicative of large intelligence; but it was vehement and backed by a therapeutical ukase to disuse the fire. Then it was I learned that the simple faith of Householder A, founded on the simple prejudice of Medical Man A B was rock firm—inert against infinitive horse power of argument or protest, and the fire was taken away. It was very tiresome; but one had something to be thankful for, and that was what the doctor did not say.

A late Secretary to the Board of Trade has told us that two officers of a department under his care having had a personal dispute, set to work to quarrel on paper; and their observations were brought to him. In them Mr. X said of his opponent: "Mr. Y failed to appreciate the force and the energy, the justifiable force and energy, of the language which I kept back." I did not fail to appreciate the force and the energy of the things my denouncing doctor did not say—from want of knowing. However, there are signs of change; and possibly a plebiscite on the question in Harley Street might show a majority at least not averse to gas-fires.

I do not agree with the somewhat dolorous suggestion of Mr. Leeds that a direct ratio (of any importance) will exist between the figures of future issues of gas-fires and statistics of the bronchial ailments of the middle-aged of the middle classes. Business in gas-fires is certain of great expansion in all directions provided combustion products are kept in their proper places—kept moving, that is.

To breathe or not to breathe these products is the question. An analysis of gases taken from about the centre of the incandescent "fuel" of a gas-fire has shown that 10 per cent. of carbon monoxide exists, and a portion of this may be forced into the room in various ways. The late Mr. Thomas Fletcher published the results of some experiments which demonstrated that the familiar complaint of "dryness" was really due to the presence of this gas in the room, and not to a diminution of humidity.

Twelve years west-end experience has allowed me many investigations of complaints; and in my notes I have summarized the causes of dissatisfaction thus: (1) Escaped products; (2) insufficient heat; (3) cost of heat. In number as well as importance, "escaped products" were easily first, and sometimes menaced a probable permanence of the user's favour of gas as fuel, because the defects had been previously

overlooked or ignored, and their ill-effects had almost become regarded as inherent to the system.

An enumeration of elementary etceteras will be of slight interest to many readers of the "JOURNAL," but may be excused, perhaps, if likely to be of use here and there. Dividing defects under three headings—construction, fitting, flues, and draughts—I debited construction with those which proceeded from projections of the flame beyond the limits of the combustion chamber (on account of its shallowness) or too-curved frontage, in conjunction with unregulated pressure, or lateral draughts, or displaced or crumbled fuel. Direct escapes of combustion products, *via* perforations in the top panel of the frame, were caused by fracture of the rigid joint, or filling, peculiar to the warm-air arrangement of certain stoves. Then there were defective burners—defective through split metal, faulty adjustment, or faulty ignition—either primarily or secondarily, due to inferior workmanship. To the discredit of fitting I put: Bad position; insufficient air supply for combustion; non-provision of flue-bend, elbow, or other conduit to chimney; loose-jointed lengths of flue pipe connected with one another or the stove collar; no cone; a length of flue pipe just slipped on the stove-collar, and pushed back so far that the rear surface of the fire-place recess baffled the exit of products; perforated flue pipes.

Flues I accounted responsible for down-draught through syphonal action due to an adjacent flue or a well-staircase. [And here I may remark that in modern well-built residential flats, with doors and windows close-fitted, and floors designed to be non-porous, troubles from this source seem bound to increase.] Then there are cooled products resulting from the large cross-section of the chimney, dampness, or leakiness, of the chimney walls.

Lastly, eddies have to be reckoned with, caused by wind impact upon an adjacent building of greater elevation.

Each of the above was the cause of a circulation of the combustion products in a living apartment; and so long as each remained unremedied, it was an active agency for prejudice against gas-fires.

Tracking the source of trouble is sometimes a long process; but the time is well-spent. The remedies are obvious; but two cases that I had are perhaps worth describing here. One was an obstinate case where the too-rapid cooling of the products was prevented by enclosing the 3-inch flue pipe in asbestos wrappings; the other—a case where wind eddies had caused a room to be practically uninhabitable—was satisfactorily dealt with by having an easy bend made for the top of the chimney, and a galvanized iron pipe run off slantwise, in a direction at right angles to the wall that caused the eddy, and to the width of the building, and then turning up the end of the pipe and fixing a plain cowl as a terminal.

One word more. In considering a solution for a trouble arising from a flue, it must be borne in mind that draught is due to the unbalanced pressure of a column of heated gas against a heavier column of outside air; that air may pass down as freely as it may pass up, and occasionally no current either way may exist; that the heaviest work is just after lighting the fire.

32, *Perrymead Street, S.W., March* 11, 1906. J. ARNOLD.

Purification Results.

SIR,—I am surprised at engineers "blowing their trumpets" about purifying results. I should not like to meet the manager any morning and have to tell him we had only passed 10 or even 20 million cubic feet through our boxes (and they are the ordinary grids) between changes. We have four boxes, each 20 feet square and 5 feet deep, charged with Irish bog ore. I will quote a few recent changes for the information of those who think they are doing well with their patent arrangements, which are generally so expensive.

No. 1.—*Oxide Old.*

		Cubic Feet.
On Sept. 11, 1905	index	53,600,000
Off Nov. 14, 1905	,,	92,777,000
Gas passed		39,177,000

This same oxide was put on again:

		Cubic Feet.
Jan. 4, 1906	index	32,810,000
Still working, March 14	,,	79,925,000
Gas passed		47,115,000

No. 2.—*Oxide Old.*

		Cubic Feet.
On Oct. 3, 1905	index	65,540,000
Off Jan. 2, 1906	,,	29,643,000
Gas passed		64,103,000

Put on again (sulphur, 54·30; water, 6·10).

		Cubic Feet.
Jan. 27, 1906	index	47,425,000
Still running, March 14	,,	79,925,000
Gas passed		32,500,000

I think this will be sufficient to let some of your readers see what can be done by having the oxide in a proper condition as to moisture, and no lumps like hen's eggs. We do not put in sawdust or anything else to loosen it. As to back-pressure, it is very seldom that we have more than 10-10ths; at present our heaviest is only 7-10ths. The sulphur compounds, according to the corporation analyst, last year averaged 12·62 grains per 100 cubic feet.

March 14, 1906. AN OLD FOREMAN.

Mr. Surman and his Retirement.

SIR,—Just a few lines to thank you for your very kind notice of my services with, and my retirement from, the South Metropolitan Gas Company, by which, needless to say, I feel much honoured.

As you note, Sir, the changes I have seen in the gas world are indeed almost stupendous; and while contemplating them, one cannot but wonder what the next fifty years will produce. To the incomers, I trust they, in their turn, will carry forward the good work and improve upon us as much as we have upon our predecessors; for who considers but must see how much the happiness and comfort of mankind are promoted by the advance of the gas industry.

To all beginners, I would say but one word, "Forward;" and to all my contemporaries and friends "Farewell."

New Cross, S.E., March 13, 1906. J. SURMAN.

Scottish Junior Association: Eastern Division. The Recent Visit to Dundee.

SIR,—In last week's issue of the "JOURNAL," a paragraph giving an account of a visit paid by the members of the Eastern District branch of the Scottish Junior Gas Association is adversely criticized by your Scottish correspondent; and, as President of the Association, it is my wish to explain matters as far as possible.

In the first place, the Dundee Gas-Works is not among the names of the places to be visited by the Association this session—according to the published syllabus; and therefore there could not have been a visit by the Association in any official sense on Saturday, March 3.

That nine members of the Association—personal friends of Mr. Jas. Simpson, of Inverkeithing, who carried out the arrangements—did visit Dundee on that occasion, and were received and shown over the works by Mr. Yuill's chief assistants, is nevertheless a fact; and it is this that is evidently causing a "rift within the lute."

I have just received a communication signed by Mr. A. M. Fyfe, Engineering Assistant, and Mr. Mitchell, Works Superintendent, of the Dundee Gas-Works, in which the views of Mr. Yuill on the subject are given, along with the recommendation that I, as President of the Association, should hasten to correct any wrong impression that may have been conveyed by the article in question.

It will be noticed that Mr. Yuill deprecates the idea that is inferred in the "JOURNAL," that this visit of a few will in any way affect the official visit spoken of as likely to take place next session; and it is to be hoped the unpleasantness that has cropped up will pass away, for it is quite evident that Mr. Yuill understood that the visit was in no way official, and is willing to place the works at the disposal of the Association should they desire to visit Dundee at any time.

Dunfermline, March 16, 1906. JAS. DICKSON.

P.S.—I enclose copy of a letter received from Messrs. Fyfe and Mitchell, which explains itself.

[COPY.]

Gas Engineer's Office, Dundee, March 14, 1906.

Mr. James Dickson, President Eastern Division Scottish Junior Gas Association.

Dear Sir,—We are surprised to find in the "GAS JOURNAL" of date March 13 exception is taken to the visit of some of the members of the Junior Association on the 3rd inst.

While it was not an official visit, Mr. Yuill received the visitors as members of the Association, and not as private individuals. Nevertheless, Mr. Yuill authorizes us to state that the visit referred to will in no way affect the official visit proposed; and he expresses the desire that no ill-feeling will be created. Moreover the fault (if any) appears to be with the public Press, and not with any of the visitors.

Under all the circumstances, we have now to ask that you will be good enough to communicate with the Editor of the "GAS JOURNAL," and call upon him to rectify in his first issue the wrong and undesirable impression created by the article referred to.

(Signed) ANDREW MORTON FYFE, Engineering Assistant.
WILLIAM MITCHELL, Works Superintendent.

SIR,—I am sorry that by a misrepresentation in the "Dundee Courier" of March 5, in reference to a visit of a few members, in a purely unofficial sense, of the Eastern Branch of the Scottish Junior Gas Association, some ill-feeling has been caused.

I am reported to have thanked Mr. Yuill in the name of the Association. I certainly did thank Mr. Yuill, on behalf of the members present, for his kindness in permitting us to visit the works; but certainly not in the name of the Association.

There is no one more interested in the Junior Association than myself, or more eager to assist in all its undertakings; and I regret that an account of the visit should have been published as if it were in any sense official. The simple facts are that I arranged with a few friends—members of the Association—to pay a visit to the Dundee Gas-Works, in order to improve our knowledge; and I cannot see what this has got to do with any one.

Mr. Yuill understood that the visit was not official, and every one else did; and the newspapers ought to have inquired more closely before publishing an account of the affair.

If I cannot go for a week-end to visit a gas-works along with a few friends, simply because I am a member of the Scottish Junior Gas Association, then that membership is not worth having.

I can go back to the Dundee Gas-Works, should an official visit take place, with great profit to myself in an educational sense; and I am sure all the others will be able to say the same.

Inverkeithing, March 16, 1906. JAMES SIMPSON.

London and the South Wales Water Bill.—At the meeting of the London County Council last Tuesday, the Parliamentary Committee recommended that the Council should oppose the Glamorgan and South Wales Water Bill, now in Parliament, and that the costs of the opposition should be paid out of the county fund. In answer to questions, Dr. Napier, M.P., said he knew that the Metropolitan Water Board were opposing the Bill, and the Board had asked the Council to join in the opposition. Under the Bill it was proposed to create a water authority for a portion of the area in South Wales which the Council some years ago considered to be suitable for a further water supply for London. Sir R. M. Beachcroft (the Chairman of the Metropolitan Water Board) said the matter was of considerable importance to London; and as there was some doubt whether the Water Board would have *locus standi* in opposition to the Bill, they had asked the Council to oppose. The recommendation was adopted.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Tuesday, March 13.

Yarmouth Water-Works and Lowestoft Water and Gas Bill.

On the order for the second reading of this Bill,

Lord BALFOUR explained, on behalf of the promoters, the main object of the measure as being to obtain an increased water supply for Yarmouth and Lowestoft. He said there was nothing in the Bill beyond the ordinary practice of Parliament; but whether or not the provisions were such as should be allowed, was a matter to be decided much better by a Committee than by debate in the full House.

The Earl of KIMBERLEY moved, as an amendment, that the Bill be read a second time that day six months. He said there was an extraordinary amount of feeling in Norfolk against water being taken away for Lowestoft and Yarmouth. The Broads of Norfolk were great recreation grounds in summer by all sorts and conditions of people; and if a small portion of the water of the Bure were taken away, the charm of the Broads would be destroyed. The Yarmouth Corporation strongly opposed the scheme, because the quality of the water was absolutely unfit for drinking owing to contamination with organic matter.

The Earl of ONSLOW said that the duty of defending the interests of Norfolk could not be entrusted to a better body than the County Council. All the circumstances of this controversy would be examined with the aid of Counsel and a Select Committee.

The amendment was withdrawn, and the Bill was read a second time.

The following further progress has been made with Bills:—

Bills read a second time and committed: Crediton Lighting and Power Bill, Great Yarmouth Water-Works and Lowestoft Water and Gas Bill, North Sussex Gas and Water Bill, Portsmouth Water Bill, Truro Gas Bill.

Bill reported, with amendments: Kidderminster Gas Bill.

The Accrington District Gas and Water Board Bill, Fulwood Urban District Water Bill, Holyhead Water Bill, and Wolstanton United Urban District Council Gas Bill, have been referred to a Select Committee, consisting of Earl Cawdor (Chairman), Viscount Hill, Lord Ellenborough, Lord Abinger, and Lord Northbourne; to commence sitting to-day.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Ascot District Gas (Electric Lighting) Bill, Brixham Gas (Electric Lighting) Bill, Cheltenham Gas Bill, North-East Lincolnshire Water Bill, Rochester, Chatham, and Strood Gas Bill.

Bill reported, with amendments: Todmorden Corporation Bill.

On the motion for the second reading of the Rathmines and Rathgar Extension and Improvement Bill—by which the Urban District Council of the places named sought power to extend their boundaries, supply water and electricity within the added area, and purchase the water-mains of the Dublin Corporation therein, Mr. Clancy moved, as an amendment, that the second reading be put off for six months; and it was carried by 282 votes to 73.

EPSOM AND EWELL GAS BILL.

House of Commons Committee.—Wednesday, March 14.

(*Before Mr.* H. J. TENNANT, *Chairman, Viscount* TURNOUR, *Mr.* HODGE, *and Mr.* VERNEY.)

This was a Bill promoted to confer further powers on the Epsom and Ewell Company in reference to the supply of gas within the area granted to them under their Incorporation Act of 1877.

Mr. C. HUTCHINSON appeared for the promoters; Mr. TALBOT represented the Redhill Gas Company, who petitioned against the Bill.

Mr. HUTCHINSON, in opening, said the Bill was to enable the Company to raise additional capital for the purpose of their undertaking, to construct certain new works in order to enable them to give an increased supply of gas in their area of supply, to consolidate their capital, and to reduce the statutory dividend to 5 per cent. and reduce the standard price of gas. Before 1877, the Company had existed as a non-statutory concern; and by the Act of 1877 a certain area of supply was given to them. From that time up to the present, the area had always been efficiently attended to, and there had been no complaints of the way in which they had carried on their business. In 1877, there was granted to them a capital of £60,000—£30,000 of which was their original capital and £30,000 the additional capital. The former was divided into shares of £25; and upon these they were entitled to pay a statutory dividend of 8 per cent. On the remaining £30,000, they were entitled to pay a maximum dividend of 7 per cent. Then they had borrowing powers of £15,000. They had raised all their capital and the whole of the debentures. So far as consolidation and conversion was concerned, this was a method of dealing with capital which was somewhat advantageous to the consumer and to the Company. They had always been subject to the sliding-scale. What they proposed to do was to consolidate the whole of their stocks together, and instead of leaving themselves the maximum dividends of 8 per cent. and 7 per cent., they left themselves a maximum dividend of only 5 per cent. They called in their existing shares, and they re-issued shares to the holders of the original capital to an amount that left them in exactly the same position as before. They called in their original shares of £30,000, entitled to 8 per cent., and they issued to them £48,000 entitled to 5 per cent. In regard to the £30,000 entitled to a dividend of 7 per cent., they reissued shares to the extent of £42,000, entitled to a dividend of 5 per cent. So far as the consumer and the supply of gas were concerned, the Company were left in the same position as before; but the practical effect of the operation was to render the shares a little more marketable. When he said the maximum dividend, he meant the standard dividend. In connection with the extension of their supply of gas, as the consumption had increased considerably it required an additional amount of capital. The capital that was necessary was about £70,000, subject to a 5 per cent. standard dividend, with borrowing powers of £35,000. The progress of the Company had very largely increased in recent years. In 1895, there were 850 consumers; in 1905, 1893 consumers. In 1895, they carbonized 4700 tons of coal, and sold 44¾ million cubic feet of gas; whereas in 1905 they carbonized 5600 tons and sold about 87 millions, or an increase of something like 96 or 97 per cent. in the total quantity sold in that period. They proposed to reduce their standard price from 5s. 6d. to 4s. 6d. per 1000 cubic feet; leaving it to the operation to a sliding-scale. At the present time, the price was only 3s. 7d.

The CHAIRMAN: It is the standard upon which you have to calculate dividends?

Mr. HUTCHINSON said that was so. The only petitioner against the Bill, the Redhill Gas Company, had not exercised their power to supply gas over the whole of their area. They had farmed it out to other people—presumably for purposes of profit. One of the objects of the promoters was to extend their area of supply, and to take in Walton-on-the-Hill, which was within the Redhill Company's district. Walton-on-the-Hill adjoined their area; but it was within the natural jurisdiction of their territory. As there was a demand for gas springing up there, the promoters were desirous of supplying the district. The promoters would have been content to come before the Committee with clause 27—giving a suspensory power—undeleted. The Lord Chairman, however, in the other House said that if they were going to supply gas in that area for the benefit of consumers, there must not be a three years' suspensory power at all, but that they must put in a clause ousting the Redhill Company and annexing the district to their area forthwith. The short point the Committee had to determine was whether, in view of the public interest, his learned friend should still be allowed to sit upon what must be an addled egg.

Mr. *H. E. Jones*, the Chairman of the Epsom Gas Company, described the action of the Redhill Company as a "dog in the manger" policy. The promoters were willing to come under an obligation, if they should be allowed to do so, to take their mains into the parish of Walton-on-the-Hill within a year after the Bill became law.

In cross-examination by Mr. TALBOT, witness said his belief was that the Redhill Company could not and would not supply gas to Walton. He could not refer to any precedent in which Parliament had taken compulsorily the area of one gas company and given it to another. He was not generally in favour of doing so; but in this case the geographical position should be considered.

Mr. *W. Isaac*, a member of the Walton-on-the-Hill Parish Council, stated that he was present at a meeting of the Council on March 9, when a resolution was unanimously passed in favour of the Bill to supply gas to Walton.

This concluded the evidence for the promoters.

Mr. *James Paterson*, the Engineer and Secretary to the Redhill Gas Company, examined by Mr. TALBOT, said the Company were established in 1860 and incorporated in 1865. They thought Walton was now ripe for a supply of gas. The Directors had considered the question of supplying there; but no definite move had been made. As soon as they knew of the proposals of the promoters, they took steps to inquire what number of consumers they could reckon on in the parish of Walton. They received 66 favourable replies out of 130; and he believed they could supply gas at a reasonable remuneration. There were routes to Walton which would enable them to get remunerative custom on the way. They had had no request for gas from any individual; but there had been some talk about it.

In cross-examination, witness stated that they had taken no steps with the Lord of the Manor to carry their mains through Walton Heath. He did not agree that the total revenue they would get from a five-mile main would not be more than £40 per annum.

Mr. HUTCHINSON: I suggest that you are going to incur an expense on mains of not less than £3000?

Witness: I do not agree with your premises at all.

The CHAIRMAN: I gathered from the witness that he did not object to the period of three years. What I mean is that, in the event of your not going through with it within three years, then you do not mind others doing so.

Witness: No; I do not object.

Mr. TALBOT urged the Committee not to put a penal clause upon them. There had been no cause shown for it. There should be an arrangement between the two Companies; and his Company would be open to any reasonable discussion.

Mr. HUTCHINSON contended that the Redhill Company had failed to discharge their statutory powers in the district for forty years.

Thursday, March 15.

On the resumption of the proceedings to-day,

The CHAIRMAN announced that the Committee had decided, subject to one or two points, to pass the preamble of the Bill. With regard to clause 27 (the disputed question), the Committee had agreed to put in the clause, but to alter the period from three years to eighteen months, and to put in the words as to supplying "some part" instead of "any part," which the promoters had expressed willingness to accept.

Mr. HUTCHINSON mentioned, in a discussion which ensued respecting the proposed alteration of the capital from £60,000 to £90,000, that, as regarded the amount of profits the Company might pay, although the face-value of the stock was nominally increased as the rate of dividend by the Act would be decreased, the burden on the consumers, if there were any, remained exactly as it was at present.

It was agreed to adjust the clauses of the Bill on Friday.

CARDIFF GAS BILL.

House of Commons Committee.—Thursday, March 15.

(*Before Mr.* H. J. TENNANT, *Chairman, Viscount* TURNOUR, *Mr.* HODGE, *and Mr.* VERNEY.)

This Bill, promoted by the Cardiff Gas Company, asked for authority to extend their limits of supply, power to purchase the undertaking of the Taff's Well Gas and Water Company, and, among other things, permission to alter the prescribed illuminating power of the gas and the burner used for testing it, and to make further provision in regard to the testing and quality of the gas.

Mr. J. D. FITZGERALD, K.C., Mr. H. LLOYD, K.C., and Mr. TREVOR LEWIS appeared for the promoters; Mr. WEDDERBURN, K.C., and Mr. ACWORTH for the Cardiff Corporation; Mr. FORBES LANKESTER, K.C., for the Glamorgan County Council; and Mr. FREEMAN, K.C., and Mr. J. SHAW for the Llandaff and Dinas Powis Rural District Council.

Mr. FITZGERALD, at the outset, said they were in the position that nearly all the opposition had been withdrawn. As to two of the opponents, there was a complete settlement; and as to the third, there was a complete settlement except on one point about which the parties were negotiating. If the Committee would take the next Bill, the result would probably be that they would not hear any more of the Cardiff case.

The CHAIRMAN: I think that will be of great advantage.

MERTHYR TYDFIL GAS BILL.

House of Commons Committee.—Thursday, March 15.

(*Before Mr.* H. J. TENNANT, *Chairman, Viscount* TURNOUR, *Mr.* HODGE, *and Mr.* VERNEY.)

The Merthyr Tydfil Gas Company, by this Bill, sought authority to construct new or additional works, and to purchase compulsorily certain specified lands, a viaduct and siding forming a means of communication with the Taff Vale Railway, and a portion of the bed and foreshore of the River Taff. Other provisions concerned the conversion and consolidation of the present capital, with power to raise more, an alteration of the Company's Act of 1868 regarding the testing of gas, regulations as to the price to be charged for gas supplied through prepayment meters, and the adoption of the sliding-scale for that sold in the ordinary way.

Mr. LITTLER, K.C., Mr. H. LLOYD, K.C., and Mr. MONRO appeared for the promoters. The petitioners against the Bill were represented as follows: Merthyr Tydfil Corporation by Mr. FREEMAN, K.C., and Mr. KNOX, K.C.; the Cardiff Corporation by Mr. ACWORTH; and the Glamorgan County Council by Mr. LANKESTER, K.C.

Mr. LITTLER, in opening, mentioned that at present the promoters had three different classes of stock—10 per cent., 7 per cent., and 5 per cent. They now proposed to make them all one class, because they found that 5 per cent. stock would realize in the market a somewhat higher proportionate price than either 10 per cent. or 7 per cent. stock. They asked for powers to issue £60,000 of new stock at 5 per cent., with the usual one-third borrowing powers. The necessity for this further capital was shown by the fact that whereas in 1895 the Company made 60 million cubic feet of gas, in 1905 they made 91,782,000 cubic feet. Their charge for gas had been reduced within the last two or three years. They charged some time ago 3s. 2d. per 1000 cubic feet for the town district, and 3s. 4d. for the outlying area. They now charged 2s. 10d. inside; and they proposed by the Bill to discontinue any differential charge. As to the sliding scale, they asked the Committee to give them a standard of 3s. The Company had been good servants of the public, as they had supplied gas cheaper than any other authority in Wales, with one or two exceptions.

Mr. *H. P. Linton*, the Chairman of the Merthyr Tydfil Gas Company, in the course of his evidence, said he did not think it would be of advantage for the Corporation to acquire the undertaking. The Company had supplied gas at a very reasonable rate, and had never had any substantial complaints against them. They did not want to sell, for the simple reason that they had managed the concern so well, and had a good, steady investment, which they wished to retain. When a company had been paying their maximum dividend for a good many years, this should be taken as evidence of the value of the undertaking. The points he emphasized were a steady dividend and a small price charged for gas.

In cross-examination by Mr. KNOX, witness said he did not consider his Company were under an obligation to supply a certain district where the population was growing and where colliery companies stepped in and gave the necessary supply.

Mr. KNOX: If there was any question of purchasing your undertaking, would not the best time be before you incurred this large expenditure in connection with your new works?

Witness: I think not. It would be more to the purpose if the Corporation paid off some of their existing debts before incurring more expenditure in buying gas-works.

Mr. *J. E. Kenshole*, the General Manager of the Company, described the old works and the proposed extensions, and said there was great necessity for a new holder, because if any accident happened to the works at present they had only a three hours' supply. There was no necessity for putting up another testing-place away from the works.

Mr. *Corbet Woodall* considered that the acquisition of additional land was advisable, that the consolidation of capital was distinctly desirable, and that the additional capital asked for was fair and reasonable.

Friday, March 16.

On the resumption of the proceedings to-day,

Mr. *Corbet Woodall*, in cross-examination by Mr. FREEMAN, stated that there was at present apparatus on the works for the manufacture of water gas. This could turn out 300,000 cubic feet per day, and could be put in operation in five or six hours. He admitted that it was only fair to take into account this stand-by when the question of the storage capacity of the works was considered. The Company were in a position to supply gas as cheaply as, if not cheaper than, the Corporation could do, because their capital was so low. The onus of proof should be put upon the Corporation to show why the Company should be dispossessed of their property.

Mr. ACWORTH, on behalf of the Cardiff Corporation, intimated that their opposition to the Bill was withdrawn in consequence of the promoters deleting the clause giving them power to lay pipes for the purpose of disposing of residuals.

Mr. *H. E. Jones*, Mr. *E. H. Stevenson*, and Mr. *W. James* (Solicitor, of Merthyr Tydfil) gave evidence in support of the Bill; the last-named stating that it would not be to the advantage of the district that the Corporation should purchase the undertaking. The water supply was in the hands of the Corporation; and during the last six months there was a loss upon it of over £3000.

The Committee adjourned till yesterday (Monday).

UNOPPOSED BILLS.

At a Meeting last Tuesday of the Lords Committee which deals with Unopposed Bills—Lord ONSLOW presiding—two in which our readers are interested were considered.

Kidderminster Gas Bill.—New Draft Testing Clauses for Gas Bills.

This Bill has been promoted by the Kidderminster Gas Company in order to obtain authority to alter their name, construct new works, provide for the conversion and consolidation of certain of their existing capital, and raise £51,000 more, with the usual proportion of additional. His Lordship pointed out that the Bill did not contain the gas-testing clauses. The Agent for the Bill stated that he had not seen them. A copy was handed to him, and he said he would examine it, and, if possible, adapt it to the circumstances of the Company. On the understanding that this would be done, the Bill was ordered to be reported to the House. We believe the Company have since accepted the clauses, which are as follows:—

1.—For the purposes of the Gas-Works Clauses Act, 1871, the prescribed testing-place shall be a testing-place which shall be provided by the on the lands described in the schedule [or otherwise] to this Act before supplying, or within one month after beginning to supply, gas under the authority of this Act.

2.—(1) The quality of the gas supplied by the shall, with respect to its illuminating power, be such as to produce, at the testing-place hereinafter mentioned, a light equal in intensity to the light produced by sperm candles of six to the pound.

(2) The burner and other apparatus to be used for testing the gas, and the method and rules to be observed in the testing, shall be such as are for the time being prescribed for testing the illuminating power of gas under the provisions of the London Gas Act, 1905, in cases where the illuminating power required is the same as that required by this Act.

(3) The shall, before supplying, or within one month after beginning to supply, gas under this Act provide all the apparatus required by this Act for the testing of gas, and shall at all times keep the same in proper order and repair.

3.—(1) All gas supplied by the to any consumer of gas shall be supplied at such pressure as to balance from midnight to sunset a column of water not less than 6-10ths of an inch in height and from sunset to midnight a column of water not less than 8-10ths of an inch in height at the main, or as near as may be to the junction therewith of the service-pipe supplying the consumer.

(2) Any gas examiner appointed under the Gas-Works Clauses Act, 1871, may, for the purposes of this Act, subject to the terms of his appointment, at the said testing-place or elsewhere, not being the immediate approach to any railway bridge or railway station, as and when he thinks fit, test the pressure at which the gas is supplied, and for that purpose may open any street, road, passage or place vested in or under the control of any local or road authority, and two hours' previous notice shall be given to the of the time and place at which any testing for pressure elsewhere than at the testing-place will be conducted.

4.—No penalty shall be incurred by the for insufficiency of pressure, defect of illuminating power, or for excess of impurity in the gas supplied by them in any case in respect of which it is proved that such insufficiency, defect, or excess was produced by an unavoidable cause or accident.

Mirfield Gas Bill.

The object of this Bill is to consolidate the existing capital of the Mirfield Gas Company, and to obtain authority to raise £20,000 of further capital, with the usual powers to borrow one-third in addition. Formal evidence as to the preamble was given, and further consideration of the measure was postponed for a week to allow a report on the Bill by the Home Office, which had only been received that morning, to be dealt with.

Electric Power Supply for London.—The House of Commons papers recently contained notices of questions by Mr. A. C. Morton and Mr. H. C. Brodie, as to whether—in view of the number of Bills for the supply of power to different parts of the Metropolitan area which are before Parliament, or likely to be before Parliament in the near future—the Prime Minister had considered the advisability of appointing a Royal Commission to inquire into the whole subject, and whether he was able to announce any decision in this respect. Sir Henry Campbell-Bannerman has replied that there is no intention of appointing such a Commission.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GASLIGHT COMPANY.

A Further Reduction in Price.

The Ordinary General Meeting of this Company was held on Monday of last week, under the presidency of Mr. WILSON MAPPIN, J.P. (in the absence of the Chairman, Sir F. T. Mappin, Bart.).

The GENERAL MANAGER and SECRETARY (Mr. Hanbury Thomas) read the notice convening the meeting; and the report and accounts—noticed in the "JOURNAL" for Feb. 20, p. 511—were taken as read.

The CHAIRMAN said he had to express Sir Frederick Mappin's regret at not being present. They had again to present very satisfactory accounts. On April 1, 1905, they reduced the prices of gas to 1s. 6d., 1s. 4d., and 1s. 2d. per 1000 cubic feet; and they were now able to pay their maximum dividend of 10 per cent. per annum, and to carry £10,725 to the unappropriated balance, which would thus be £83,971, in addition to the reserve fund of £86,848, which was the full amount permitted by Act of Parliament. The Directors felt that they were in a position to reduce the price again from April 1 next—making it 1s. 5d., 1s. 3d., and 1s. 1d. per 1000 cubic feet. During the half year, 1148 tests were made by the Corporation officials and the Company's officers, showing the average quality of the gas to be 17·36 candles. The coal carbonized cost less by £3101 than in the corresponding half of 1904. Repairs of mains and services cost £1618 less, coke realized £872 more, and sulphate of ammonia £2959 more. The fittings department had yielded them £610 more profit. On the other side of the account, purifying materials and wages had been £897 more; and the gas sold realized £5631 less, on account of the reduction in price. Tar also had brought £1783 less. There was left a profit of £53,651 on the working of the half year. There had been 146,659 tons of coal carbonized—an increase of 5613 tons over the same half of 1904. The gas sold had been 1,496,108,000 cubic feet; being an increase of 86,982,000 cubic feet over the corresponding period. The leakage amounted to 39,664,000 cubic feet, or 2·58 per cent., as against 4·10 per cent. in the same half of 1904. The receipts for gas per ton of coal carbonized had been 14s. 3·78d., against 15s. 8·20d. per ton in 1904; the decrease having been on account of the reduction in price. The additional meters fixed in the year 1905 numbered 4205; the sizes varying from 3 lights to 800 lights. The total number of meters fixed up to Dec. 31, 1905, was 81,926. Sixty-nine gas-engines were fitted up during the year. The gas-fires sold in the past six months numbered 1113, boiling and other stoves 789, incandescent burners 9083, and cookers let on hire 253. The new gasholder at Neepsend had been in use during the winter, and had worked satisfactorily. There were only 307 complaints due to naphthalene in the half year. The increase in the sale of gas still continued satisfactory. From Jan. 1 to the end of February, it was 47,204,000 cubic feet, or 7·47 per cent., as compared with the corresponding period of the previous year. He had noticed some Press correspondence with regard to the charging of rents for meters. This, appearing close upon the intimation of a reduction in the price of gas, seemed to him a little surprising. One important gas company abolished meter-rents some years ago, but contemplated returning to the old custom on account of the large number of meters that were kept merely for when the electric light failed. Such meters rapidly deteriorated when not in use. The Sheffield Company could not see their way to abolish meter-rents. He would like to draw attention to their maintenance system connected with incandescent burners. The men called fortnightly to renew mantles and see that all was in order, for the small sum of 3d. or 4d. per burner per month. He believed many people only had these burners in their principal rooms, and did not have them in the kitchens and other parts of the house. More gas was often consumed in the kitchen premises than in the best rooms; and his own experience was that the maintenance charges were recouped in the diminished quantity of gas consumed. He concluded by moving the adoption of the report.

Mr. H. K. STEPHENSON seconded the motion, and expressed the regret they all felt at Sir Frederick Mappin's absence, which the shareholders would be glad to know was not due to any failure of health. They had evidence of Sir Frederick's work in the excellent report which had been presented.

The motion was carried.

A resolution authorizing the payment of the dividends recommended was passed on the motion of the CHAIRMAN, seconded by Mr. WOOD.

Mr. J. B. WOSTENHOLM moved, and Mr. T. RICHARDSON seconded, a vote of thanks to the Chairman, Directors, and staff of the Company.

PROVINCIAL GAS COMPANIES.

A Record Half Year at Bognor.

Mr. H. Lovett, the Chairman of the Bognor Gas Company, in submitting to the recent meeting the report and statement of accounts, said the past half year had been the most successful since the formation of the Company forty years ago. The increase in the consumption of gas had been 1,946,000 cubic feet, or 9·87 per cent., over the previous corresponding half year, and 7·87 per cent. for the year 1905. The output had more than doubled within the last eight years. The number of private consumers had increased during the past year by 166—all of whom took cookers. The prosperity of the Company had caused them to reduce the price of gas by 3d. per 1000 cubic feet in March, 1903, which meant giving £343 to the consumers; and the Directors proposed to make a further reduction, as from the end of the present month, of 2d. per 1000 cubic feet to ordinary, and 3d. to coin-meter consumers. This reduction would mean £350; so that in this short period a reduction would have been made representing about £700. For such a satisfactory state of affairs they were largely indebted to Mr. W. Hammond, their Manager, who got more gas from an average ton of coal than was produced at any works in the district. The Directors would have liked to have done a little more for the consumers; but they had to face a considerable outlay of capital for their new works. It was pointed out by Mr. John Hammond, of Eastbourne (a Director), that the contemplated removal of the works to outside the town was not only necessary to meet the increased demands, but would save them the coal dues, which would enable the Company to still further benefit the consumers by cheaper gas. The report was adopted. Dividends were afterwards declared of 5½ per cent. for the half year upon the original shares and 4 per cent. on the new shares—making 11 and 8 per cent. respectively for the year. An increase in the Directors' fees was agreed to; and the meeting terminated with votes of thanks to the Directors and to the Manager, Secretary, and staff.

Good Working under Unfavourable Conditions at Dover.

Several causes were in operation at Dover, in the latter half of last year, which, but for good management, might have caused the Directors of the Gas Company to report a falling off in the business. Trade and work were slack, a large number of houses were unoccupied, the weather was mild and bright, and there was the competition of other illuminants. Notwithstanding these drawbacks, however, the Directors were able to present a very satisfactory statement at the recent half-yearly meeting, and to recommend the payment of the full dividend at the rate of 7½ per cent. per annum (less income-tax), and carry forward £1146 out of the profit made in the six months. The Chairman (Mr. Willsher Mannering), in moving the adoption of the report, congratulated the proprietors on the excellent results of the working and the sound position of the Company's affairs. After dealing with the various items in the revenue account, he said the balance carried to profit and loss was £5787, against £4904, or an increase of £883. After paying interest on loans, income-tax, and placing £250 to the Trevanion Street gasholder suspense account, the profit for the half year was £1146 in excess of the sum required for the full dividend. This, added to the surplus balance, would leave £3518 to be carried forward. During the year the increase in the number of consumers had been 126; the total number at the close being 6193, against 6067, of whom 3426 used prepayment meters. Another source of supply had been found by the introduction of high-power lamps, which were now largely used for lighting the outsides and interiors of shops, halls, and offices. The Company had recently fixed 180 of these lamps; and he was pleased to say they were giving general satisfaction. The Chairman concluded by expressing the Company's indebtedness to the staff for their devoted and faithful services. The continued prosperity of the undertaking was, he said, ample proof of the efficient manner in which the officers and the employees discharged their duties. Mr. T. Fry seconded the motion; and it was carried unanimously. In returning thanks for the usual complimentary vote to the Board, the Chairman proposed a similar vote to the Secretary (Mr. G. Fielding), the Engineer (Mr. R. Herring), the office staff, and the workmen. He said he included them all because they all worked together most harmoniously, and he believed did their very best in the interests of the undertaking. Mr. Fielding and Mr. Herring acknowledged the vote.

Increased Consumption at Londonderry.

At the recent annual meeting of the Londonderry Gas Company, the Directors reported that the revenue account for the six months ending Dec. 31 last showed a balance of £4257 to be carried to the credit of the profit and loss account. Out of this sum, they recommended a dividend at the rate of 10 per cent. on the old and 7 per cent. on the new shares, free of income-tax. This would absorb £4160, and leave £97 to be carried forward. The Directors congratulated the shareholders on the prosperity of the Company and the successful working of the past year. The consumption of gas increased notwithstanding the competition of other illuminants. The Chairman (Mr. H. J. Cooke), in moving the adoption of the report, emphasized the statement contained therein to the effect that, in spite of the competition of rival systems for the production of light and power, the consumption of gas had increased. He said there had been a good demand for cooking-stoves; and the Company had supplied a considerable number of gas-fires and other heating appliances, such as gas-irons, radiators, boilers, grillers, &c., all of which were becoming very popular. Numerous gas-engines had been connected for various purposes; and, on the whole, the number of consumers had materially increased. As regarded the works, they were in fairly good order. Dr. Miller, in seconding the motion, said he thought the proprietors would agree with him that the report was very satisfactory, considering the rivalry with the electric light supplied by the Corporation—a rivalry which, in his opinion, was not a fair one, as they had the rates to fall back upon. After some remarks on the report, it was adopted; and the dividends recommended were declared.

Prospective Reduction in Price at Wrexham.

The accounts submitted at the annual meeting of the Wrexham Gas Company showed that there had been a capital expenditure during the past year of £11,110, which included the cost of the completion of a new gasholder. The sale of gas yielded £15,706, of which £4787 was obtained from slot meters. The residual products realized £3803. On the revenue account, there was a profit of £7727. This account, the Chairman (Mr. J. O. Bury) remarked, showed satisfactory results, for though there had been a net decrease in receipts from all sources of £295, the net decreased expenditure amounted to £2177. The receipts from ordinary customers decreased by £663; but there was an increase of £407 in those from prepayment customers, of whom there were now 2700. After allowing for the payment of maximum dividends and interest on loans, amounting to £4922, the Directors had been able to place a surplus of £2804 to the credit of the profit and loss account. Having regard to the excellent condition of the Company, they proposed, as from July 1 next, to make a reduction of 3d. per 1000 cubic feet in the price of gas. There was a reduction of 3½ per cent. in the

make—a fact which was attributed to the more general use of incandescent mantles and increased care exercised by consumers in the use of the illuminant. The Directors had been applied to by the Parish Councils of Broughton and Esclusham Below to extend the mains to the thickly-populated parts of Broughton and the village of Rhostyllen, which were at present without any means of obtaining artificial light. It had been decided to carry out plans for the supply of gas to Rhostyllen; but with regard to Broughton, the Directors were satisfied that it would be unwise to carry out extensions involving a long line of unproductive main in a district so greatly affected by mining operations. The Broughton Parish Council had now asked them to relinquish their statutory powers, so as to allow gas to be provided by private enterprise. This the Directors could not do; but, while retaining their powers, they saw no objection to gas being supplied by a private company in the upper part of Broughton. An interim dividend was declared of 5 per cent. upon the consolidated stock, and 3½ per cent. upon the shares; this being at the rate of 10 and 7½ per cent. per annum respectively.

A Reconstituted Company at Torpoint.

The statutory meeting of the Torpoint Gas Company, which has been reconstituted under the Companies Acts, was held on Wednesday last—Mr. W. J. Waycott presiding. It was reported that the total number of shares allotted was 3049, of which 1503 had been issued as fully paid up in consideration of the transfer of the undertaking of the old Company. On the remaining shares, the sum of £1 each had been paid. The Chairman said that 30 per cent. more gas was being made now than in the days of the old Company; and that since last June, 120 cookers, 120 slot meters, and 110 ordinary meters had been put in. Mr. J. G. Clarke, the Manager of the Newton Abbot Gas-Works, said experience showed that the introduction of slot meters meant a great accession of customers. It had been very successful at Newton Abbot; and there was no reason why it should not be so at Torpoint. The Chairman, answering questions, said the plant was in very good condition. The price of gas for ordinary purposes was 5s. per 1000 cubic feet; but where gas was used for lighting and cooking combined, it was 4s. 6d.

PRICE OF GAS FOR POWER AND HEATING AT BURTON.

At the Monthly Meeting of the Burton-on-Trent Town Council on Wednesday last, the following resolution came up for consideration, in accordance with notice of motion (*ante*, p. 516): "That from the dates that the respective indications of the meters are taken for the quarter ending March 31, the price of gas exclusively used for gas-engines, or for heating purposes only, and registered by separate meters, shall be as follows: (1) For gas supplied within the borough for gas-engines only: (*a*) When the quantity supplied per quarter is under 100,000 cubic feet, at the rate of 2s. 4d. per 1000 cubic feet; (*b*) When the quantity supplied per quarter on one premises is 100,000 cubic feet and under 750,000 cubic feet, at the rate of 1s. 9d. per 1000 cubic feet; (*c*) When the quantity supplied per quarter on one premises is 750,000 cubic feet and over, at the rate of 1s. 6d. per 1000 cubic feet. (2) For gas supplied within the borough for heating purposes only, when the quantity supplied per quarter is 250,000 cubic feet and over, at the rate of 1s. 9d. per 1000 cubic feet." It was also proposed that a proportionate decrease should be made in the price of gas for power purposes to those consumers residing at Newton Solney, and on that portion of Newton Road situate outside the borough boundary.

Alderman LOWE said that his position as Mayor that day, in moving a resolution which was of a more or less contentious nature, was somewhat unusual; but he trusted that when he had laid before the Council the whole of the facts which had induced the Gas Committee to make the recommendation referred to, all division of opinion would be removed. During the last few years great advances had been made in the manufacture and science of gas-producer plants; and the supply of ordinary lighting gas for power purposes had been very seriously threatened thereby. He might say that intimations had been received by the Committee from a number of firms which clearly showed that, unless immediate steps were taken to reduce the price of gas for power purposes, they would lose a considerable amount of their trade; and it was therefore necessary that this step should be taken, in order to check the competition which this new plant had brought about. After weighing the *pros* and *cons* of the matter—and there were many of them—the Committee considered that the recommendations they had to make would best meet all the interests concerned. The interests of the ratepayers at large were closely bound up with their maintaining the largest possible trade they could, as long as that trade was done at a profit; and while he was on this point, it would be just as well for him to say that the present cost of producing gas was 1s. per 1000 cubic feet, and that all the other charges—such as distribution, interest, and repayment of loans, management, &c.—were fixed, and would vary to only a slight extent, whatever the output of gas might be. So the Council would see that all the Committee received beyond 1s. per 1000 cubic feet went to help to pay those fixed charges. If they lost the contribution made by the large consumers towards these fixed charges—or part of it—they must bear in mind that the total charges remained the same, and had to be borne by the fewer consumers that were left; and, therefore, the fixed charges per 1000 cubic feet would have to be increased. It would thus be seen that it was certainly in the interest of the consumers that they should not lose this source of income. With regard to the price decided upon, he felt sure this was such as would make anyone consider twice before going to the expense or outlay of putting in a producer plant. They (the consumers) had to remember that in the Corporation gas they had a supply which was absolutely reliable and always there; whereas the producer-plant was sometimes unreliable, and caused irritating delays and stoppages in working. Then they had to agree upon a price which would meet the demands of the owners of large gas-engines of 50 or 60 horse power. It was an established fact that this was a size of engine which was more suitable and adapted to work economically with a producer-plant than any other; and it was therefore necessary for the Committee to make a recommendation of this particular price. Now let them look for a moment at the financial effect of the alteration. If the resolutions passed, the result would be a reduction of about £550 in the Committee's receipts compared with those derived from the present price. But though there was a reduction in the receipts, they would still be receiving a considerable contribution towards their fixed or "dead" charges and if they lost the contribution, as he had already pointed out, the charges must be increased to the remaining consumers. He was sure the Council would agree with him that, as trade was at present in Burton, it was most undesirable that anything of the sort should take place. This fact was being realized up and down the country pretty generally; and hardly a month went by without some company or corporation passing resolutions similar to the one he was submitting that day. If they in Burton lagged behind, they would find their trade gone when it was too late to get it back; and this would be a most deplorable state of affairs. Perhaps he might venture to anticipate any suggestion that may be made for a general reduction in the price of gas. They were all aware that in the Corporation there were some departments in which there was likely to be increased expenditure. In any case it would be difficult to keep the rates at their present level; and when they contemplated the possibility of a reduction in their rateable value and the general depression of trade throughout the town, it seemed to him absolutely incontrovertible that it was of the utmost importance to maintain the financial position of the gas-works—their one great earning department—as strong as possible. The reduction now proposed was not recommended to meet any demand for a lower price, but to enable the Committee to compete with a new factor which was developing, and which, if not checked, would do them considerable injury.

Mr. HUTCHINSON said he was not going to advocate a general reduction in the price of gas, though he was in favour of it, because he did not think it would be any use trying to persuade the Council to do so. The Mayor had said that the cost of producing gas worked out at 1s. per 1000 cubic feet, and they would charge 1s. 6d. for it. Well, he understood that they could not produce the gas for 1s. 6d., let alone 1s.; and if they were going to sell it at a loss in order to save loss, he would rather let those people take their custom elsewhere. He believed it would be possible to make gas at less than 1s. 6d. by means of suction producer plant. If it could be shown that they could sell gas at a profit for 1s. 6d., then the question arose, Why on earth had they charged the small consumer 2s. 9d. per 1000 feet for so long?

Mr. HARLOW moved that the matter be referred back to the Committee for further consideration. He was glad to find that the Committee were alive to the rivalry of the gas-producer plant; but he could not agree that they would only be used by large consumers. He had had an estimate from Tangyes in respect of a 14-horse power engine; and he was assured the cost would not be more than 1d. per hour. He wanted the matter referred back for the sake of tradesmen who were not large consumers. There were nine firms to whom the 1s. 6d. per 1000 feet would apply, and thirteen firms who would never come under the 1s. 9d. scale, because, though they consumed the required amount annually, they did not do it per quarter. A gas-engine of 8-horse power, taking it into comparison with the price suggested, could compete with the Corporation scale and beat it. One firm in the town had an offer from Crossleys to put down a gas-producing plant which would save its cost in two years. Leicester had no stipulation as to the amount that should be consumed; but the price was 1s. 6d., while in Sheffield the charges were 1s. 6d. and 1s. 5d. for consumption per annum, and Nottingham also charged "per annum," and not "per quarter."

Alderman ROBERTS said the matter had been thoroughly discussed in all its bearings, and they were unanimous in their recommendation. It was true there was very little profit in selling at 1s. 6d. per 1000 cubic feet; but the Committee thought it better to sell at a small profit than lose the customers.

After several other members had spoken,

The MAYOR replied to the discussion. He announced that, after consultation with three or four members of the Committee, the resolution would be altered so as to give the concession upon an annual instead of upon a quarterly consumption. As to the present producing capacity of the gas-works, they could do with double or treble the number of consumers before making any extensions. His information did not tally with that of Mr. Harlow as to producer plants being put down for 8-horse power engines; and that information was only about a month old.

Mr. HARLOW: I got mine yesterday.

The MAYOR: I am not here to advocate the putting down of producer plants, but to do my best for the Corporation, and to keep our larger consumers with us.

The amendment was then defeated by a large majority; the recommendation being subsequently carried.

Monte Video Water-Works Company, Limited.—The report of the Directors of this Company for the past year shows that there was an increase of £5786 in the income, and a decrease of £300 in the working expenses, compared with the preceding twelve months. The net revenue consequently shows an increase of £6087; being £66,506, against £60,419 in 1904. On the profit and loss account, including £32,302 brought forward, and after deducting debenture interest and other charges, and an interim dividend of 3 per cent., there is an available balance of £63,928. The Directors recommend the payment of a further dividend of 3 per cent., making 6 per cent. for the year, tax free, and the transfer of £15,000 to a special reserve fund; leaving £33,928 to be carried forward. The past year was a satisfactory one for the Company's business; the number of services showing a steady increase, and the consumption per service being greater. In May, the Board were informed that the Municipality desired to treat for the acquisition of the Company's property and undertaking. Negotiations extending over several months were carried on between the Board and a duly accredited agent of the Municipality in London, but without any agreement being arrived at.

LEICESTER GAS, ELECTRICITY, AND WATER SUPPLY.

A Special Meeting of the Leicester Town Council was held last Tuesday, when statements were submitted regarding the working of the Gas and Water Departments.

Mr. EDWARDS, in moving the adoption of so much of the report of the Gas and Electric Lighting Committee as referred to the financial statement of the Gas Department, said that, looking at the balance-sheet, it would be seen that the outstanding capital of the department stood at £1,095,801. In regard to the revenue account, they had spent during the half year £45,064 on coal, a reduction of £2370. Carbonization wages amounted to £10,233, a decrease of £2010. Repairs and maintenance of works came to £9452, an increase of £648. In distribution, £13,603, an increase of £120, was spent; and rates and taxes amounted to £11,290, an increase of £629. The total expenditure was £97,806, a decrease of £2198 on the corresponding period of last year. On the other side of the balance-sheet, the sale of gas realized £110,171. Coke and breeze amounted to £15,361, a decrease of £5404; and tar and ammoniacal liquor, to £15,823, a decrease of £844. The total income was £143 930; and taking from this the total expenditure, they had a balance to go to the profit and loss account of £46,861. Of this, they paid £19,652 in interest charges, and added £7266 to the sinking fund. They thus had had a balance of net profit of £19,441, which, added to the profit of the first half year, made a total of £43,466. This was something like £6000 less than the previous year. In the first place, they had a decrease of 1¾ per cent. in the consumption of gas, owing to the mild winter and the increased use of the incandescent burner; and another reason was the reduced price of gas for power purposes. They had, however, made considerable savings in the consumption of coal; more gas being made per ton in consequence of the absence of naphthalene deposits. Last year there was a record profit; this year came second to it. Their hope for the future was that the trade of the town would increase, and that empty houses and warehouses would be filled. When these places were occupied by gas consumers, the Committee would bring the Council as good profits as a year ago. He thought that, under the circumstances, the Council had every reason to be satisfied with the profits shown on the present occasion.

Mr. JENNINGS seconded.

Mr. HINCKS called attention to the "tin-pot" slot-meters in use in the town. These, he said, led to the "manufacture" of burglars and housebreakers, and thereby very considerably increased the work of the police and the anxiety of the Watch Committee. He hoped the Gas Committee would give the matter their serious consideration.

Mr. EDWARDS said he was not surprised that Mr. Hincks had brought this matter before the Council. The Gas Committee were aware of the extensive pilfering that these meters led to; but he would point out that they were not of the "tin-pot" character referred to. They were the best on the market. The Committee had had the matter under consideration for some time past; and he was pleased to say that Mr. Colson had now invented a cash-box which he believed would greatly minimize the difficulty. The arrangement would be attached to the meters as early as possible. He hoped, therefore, the nuisance would soon be abated.

The motion was then put and adopted.

Mr. EDWARDS then moved the adoption of the financial statement of the Electric Lighting Department; remarking that the outstanding capital was now £218,934. Turning to the revenue account, they had spent in the generation of electricity £3198, an increase of £141; and in distribution £678, an increase of £221. The total expenditure was £6826. They had received for the sale of current £17,194, an increase of £1198; the rent of meters was £720; and profits from the fitting department £101—a total of £18,016; leaving a balance to carry to profit and loss of £11,337. They had spent in interest charges £3734, and had placed £3343 to the sinking fund; and this left a profit for the half year of £4259. Added to the profit in hand of £14,515, this gave them £18,774. They had spent out of profits £16,300 in new machinery for increasing their plant and services, instead of taking the money out of capital. This left them with a balance of £1801, which would be absorbed in the purchase of three boilers. The half year just closed was the best the department had gone through; and he was sure the balance-sheet would commend itself to the Council as evidence of the success of the undertaking.

Mr. JENNINGS seconded; and the motion was carried.

Alderman WOOD, in moving the adoption of the report of the Water Committee, said their profits last year were smaller than they had been for years past. The reason for this was that they had been short of water, and consequently had been unable to supply it for business purposes as previously. Another factor was that they had to spend more money on temporary supplies, which had had to be provided for out of revenue. Temporary supplies had cost them £3929. Their net profit was £9605, which was nearly £7000 less than last year. Their position to-day with regard to the supply showed they now had a stock of 1165 million gallons. This left them deficient of 214 million gallons, against 753¾ million gallons last year. He wanted to express to the Council and to the town the Committee's gratitude for the valuable assistance they had rendered them during a very trying year. Last December they were all exceedingly anxious; and had they had frost at the time, the town would have been without water. Fortunately, they had had a mild winter; and during January they had a rainfall which relieved them of their anxiety. To-day they were in this position. By the end of March their connections would be made with the Loughborough supply, which would enable them to obtain 1½ million gallons per day if needed. Therefore, in his judgment, knowing that they were within four-and-a-half years of receiving the Derwent water, the town would not be in danger of scarcity of water for the next fifty years. With regard to the Derwent supply, he was pleased to inform them that they were making very satisfactory progress. At the next meeting of the Council, the Water Committee would submit a report dealing with the laying of mains and the making of aqueducts from Leicester.

Alderman COLEMAN seconded; and the report was carried.

TOTTENHAM DISTRICT COUNCIL AND THE GAS COMPANY.

Opposition to the Bill Abandoned.

At a Meeting of the Tottenham District Council last Tuesday, the Legal Committee presented a report with respect to an interview they had had with Mr. Corbet Woodall, the Chairman of the Tottenham and Edmonton Gas Company, together with the Company's Engineer (Mr. A. E. Broadberry) and Secretary (Mr. James Randall), concerning the Bill which the Company now have in Parliament. It was stated that Mr. Woodall explained that a very large number of corporations and district councils were the owners of gas undertakings, and that in not one case was it attempted to put into force the sulphur clauses. He said it would be necessary to add at least 33 per cent. to the purifying area of the Company's works in order to reduce the sulphur to the limit set out in the Act. In consequence of the great increase in the use of incandescent mantles, the reduction of the illuminating power suggested would not in any way affect the light-giving value of the gas, but would decrease the cost of production. He also pointed out that a large amount of the gas now used was not required for lighting, but for cooking purposes. The Company were willing to adopt the best-known burner—the Metropolitan No. 2. Mr. Woodall said he thought that the Company would be willing to pay a sum of £300 towards the cost of constructing a footbridge over the Great-Eastern Railway, to replace the level-crossing near their works. He added that if the Bill went through Parliament without opposition, the Company would reduce the price of gas to consumers by 2d. per 1000 cubic feet as from the 1st of January last. The Committee unanimously recommended the Council to abandon opposition to the Bill, on the terms indicated in the report; and after some discussion, the recommendation was agreed to.

HULL CORPORATION AND THE SULPHUR QUESTION.

The Corporation of Hull have decided not to oppose the Gas Companies (Removal of Sulphur Restrictions) Bill, upon the subject-matter of which reports had been made by the Water and Gas Engineer (Mr. F. J. Bancroft, B.Sc.) and the Town Clerk (Mr. E. Laverack). Mr. Bancroft, in his report, explained the object of the Bill, and pointed out that one of its joint promoters is the British Gaslight Company, Limited, who supply part of the borough. He quoted the section of the Company's Act of 1901 which limits them to 30 grains of sulphur in any other form than sulphuretted hydrogen in every 100 cubic feet of gas, and said this section would be repealed by the Bill. He went on to show that, according to the fortnightly tests for sulphur carried out last year by the Corporation Gas Examiner, the quantity had fluctuated between 16·45 and 30·42 grains; and that on only one occasion had it exceeded 30 grains, and then it was within the limit allowed. In order that the question might be thoroughly understood, Mr. Bancroft briefly reviewed the matters that led up to the joint application by the Companies. He referred to the appointment of the Departmental Committee of the Board of Trade, and quoted their well-known recommendation to the effect that the obligation placed upon the Companies with regard to the removal of the sulphur impurities (other than sulphuretted hydrogen) should be abolished. He pointed out that, following the Committee's report, the three London Gas Companies and the South Suburban Gas Company had been relieved from penalties with respect to sulphur impurities, and that the Sutton, Southcoates, and Drypool Gas Company, who supply East Hull, are not under any statutory restrictions as to sulphur other than sulphuretted hydrogen. This Company and the British Gaslight Company purify by oxide of iron; and Mr. Bancroft said he did not anticipate any alteration in the method of purification if the proposed Bill was passed. The Town Clerk, who had perused the report above summarized, did not offer any objections.

STREET LIGHTING AT EXETER.

Municipal Electricity Undertaking and the Gas Company.

The Exeter City Council had under consideration on Wednesday a report by a Committee appointed last October to consider the question of public lighting. Their instructions were to obtain from the Gas Company a scheme for lighting the streets of the city other than the tramway routes; and it contained proposals for converting the whole of the public lamps outside the tramway routes into incandescent gas-lamps, and furnishing them with automatic controllers for simultaneous lighting and extinguishing. The Committee, however, confined their attention in the main to the question of the lighting of that portion of the city in which electric cables are laid. They reported that the streets which came within the scope of their inquiry have a total length of about 40½ miles, divided into the three following classes: (1) Tramway routes (including projected extension) not at present lighted by electricity—a length of about 2½ miles. (2) Streets other than tramway routes along which electric cables are laid—a length of about 13 miles. (3) Streets along which no electric cables are laid—a length of about 25 miles. In addition to these, there is a length of about 1½ miles of the tramway route which is lighted by electricity. An estimate was submitted by the Electrical Engineer (Mr. H. D. Munro) of the cost of improving the existing electric lighting and of extending it to the streets in Class 1, in which tramways are laid or are to be laid. The present annual expenditure for electric lighting 1½ miles is £814, and for gas lighting 1½ miles £320. The estimated capital outlay for electric lighting the whole length is £709; and the annual expenditure (including repayment of the capital outlay spread over ten years), £2083, or about 80 per cent. above the present cost. The approximate candle power would be 66,800, giving an increase of about 300 per cent. in illuminating power over the present gas lighting, which the report stated is extremely poor. The Electrical Engineer

also submitted estimates for lighting the streets comprised in Class 2 —namely, those in which electric cables are laid, but which are outside the tramway routes. The probable capital outlay in this case would be £1270, and the annual expenditure £1494. The Committee recommended that the whole of the existing tramway routes of the projected extension should be lighted by electricity; but that the Electrical Engineer should prepare a reduced scheme and estimate for this purpose as an alternative to the present scheme and estimate. It was decided to postpone consideration of the question of converting the lighting in the other streets in which electric cables are laid until comparative estimates have been submitted by the City Surveyor and the Electrical Engineer; and not to further consider for the present the question of lighting by electricity those streets in which there are no cables. In the meantime, the Committee recommended that the Gas Company should be requested to furnish separate schemes and estimates for lighting (*a*) the streets outside the existing and projected tramway routes along which electric cables are at present laid, and (*b*) the streets of the city along which no electric cables are laid. It was also resolved that, with a view to arrangements for a fresh agreement with the Gas Company, notice be given to terminate the present agreement by Michaelmas next.

The report was subjected to much criticism in the City Council. Mr. Commin suggested that a quarter-of-a-mile of one of the streets should be lighted by electricity, and a similar length by gas, so that the members might be able to ascertain the cost, and have a practical test of the lighting. Mr. Gadd said they wanted to have the city lighted in the best way; and, in view of the action of many corporations, who were abandoning electric lighting for gas, they ought to be extremely careful before committing themselves to any large expenditure. Mr. Varwell moved, as an amendment, that the recommendation as to lighting the tramway routes by electricity be referred back to the Committee, and that the Gas Company be asked to submit estimates for lighting such of these streets as were not at present lighted by electricity. Mr. Tarbet, in seconding the amendment, said he thought they would be absolutely foolish to commit themselves to electric lighting under existing circumstances. Mr. Loram remarked that if the cost of electric lighting came anywhere near that of gas, he would support the Committee's recommendation; but the installation of the former illuminant on the tramway routes alone would cost about £900 a year, or equal to a rate of 1d. in the pound. Mr. Stokes pleaded with the Council to do all they could to support the electricity undertaking. The amendment referring the matter back to the Committee was carried by a large majority. The Town Clerk was, however, instructed to give notice to determine the existing agreement with the Gas Company, with a view to any changes which may be made in the contract.

SUPPLY OF ELECTRICAL FITTINGS.

The Court of Referees of the House of Commons had before them last Tuesday an application by Mr. Moon, K.C., on behalf of the Charing Cross and West End, the South Metropolitan, the City of London, the County of London, and the London Electric Supply Companies, for *locus standi* against the General Powers Bill of the London County Council. He stated that the petitioners objected to Part VI. of the Bill, and especially to the following clause: "It shall be lawful for the Council of any Metropolitan Borough, being authorized to supply and supplying electrical energy, to expend money upon the wiring and fitting, and supplying with wires, fittings, motors, and apparatus, the premises of their consumers, or prospective consumers, and to enter into, and carry into effect, agreements and arrangements with respect thereto, and to make such charges therefor as they may think fit." He said that this was practically an extended form of municipal trading, and established a new competition with the companies already authorized to supply, and supplying, electrical energy within the areas of the Councils. Mr. Talbot, for the County Council, opposed the application. He stated that a precisely similar clause was passed by the House of Commons last session; but it was rejected by the House of Lords. He denied that new competition was being set up with the Companies. All that was proposed was something that was ancillary to, or making effective, the competition already sanctioned by Parliament. He submitted that *locus* ought not to be granted unless it could be shown that it was proposed to alter the whole basis of the competition. The Court allowed the *locus*.

The application of the Electrical Contractors' Association and others, that the Standing Orders might be dispensed with with a view to the presentation of a petition against Part VI. of the Bill, was on the same day refused by the Select Committee on Standing Orders.

ECONOMIES IN MUNICIPAL EXPENDITURE.

The drastic criticisms which have lately been passed on the extravagance of municipal and other public bodies are beginning to effect a reduction in expenditure. At a special meeting of the Holborn Borough Council on Friday, Mr. H. Keen, in submitting the estimates, said that though last year's estimates were considered very low, the expenditure was £3700 less than was expected. It had dropped from £110,000 to £97,000. The reduction in expenditure with the increase in the rateable value was equivalent to a reduction of 4½d. in the pound in the rates. The Guardians, however, were raising their expenditure, and the London County Council wanted £10,000 more this year than last. The Poplar Guardians have decided to reduce their demand for the ensuing half year by 5d. in the pound—from 2s. 6d. to 2s. 1d.; and it is believed that the Borough Council rate will also be lowered. The Finance Committee of the Stepney Borough Council have reported that £5464 less is required this half year, or equal to a reduction of 1d. in the pound. In the Provinces, Burnley has reduced its rate by 4d.; and at Dover a reduction of 1d. has been announced.

METROPOLITAN WATER BOARD.

The Ordinary Meeting of the Board was held on Friday—Sir R. M. Beachcroft in the chair.

An estimate of expenditure on capital account for the year 1906-7, which had been approved by the Works and Stores Committee, and been forwarded by them to the Finance Committee for inclusion in the annual estimates, was presented, and showed that the total estimated expenditure was £879,935. Of this, £5000 was required for new works in the Lea Valley, £234,411 for reservoirs and aqueducts, £15,550 for wells, £64,850 for filter-beds, £98,305 for machinery, £103,805 for buildings, £6441 for fencing, £325,623 for extension of mains and pipes, £10,950 for meters and fittings, and £15,000 for contingency provisions. At the next meeting of the Board, approval will be sought for £141,476 of the above total estimate as a vote on account.

The Works and Stores Committee drew attention in their report to the question of the supply of water for fire purposes, and to the requests made by the London County Council in the matter. The Committee referred to a report they made to the Board on May 12 last in connection with a request from the Council that new mains should be laid at the expense of the Board for the purpose of improving the supply to the fire hydrants in Norman Road, Greenwich. The Board decided that no further action on their part was then possible. The Committee now reported that the question of the improvement of the water supply for fire purposes was not a new one, and it frequently arose under the administration of the Water Companies. The Council had supplied them with returns, which showed that in some cases the cost of these improvements was borne wholly by the Companies; in others, partly by the Companies and partly by the Council; while in some cases the cost was borne entirely by the Council. The Committee desired to emphasize the fact that the position taken by the Board was that they were desirous of co-operating to the best of their ability in the object of attaining an adequate supply of water for fire purposes throughout their area, and that the only question at issue was as to whether the cost should be borne by the whole of the Metropolis or only by a part. The question was one which they had under serious consideration; but they realized that it was a matter of much difficulty, and one which might occupy some time before a solution agreeable to all parties was arrived at. They thought it was a matter of regret that, having regard to the serious condition of affairs in the road mentioned, the Council should not have seen their way to adopt the suggestion of the Board that they should carry out the necessary works at the cost of the Council, on the understanding that the ultimate decision to be arrived at with regard to the allocation of the cost was to apply to this particular case; and they did not consider that the discussion of the question between two public bodies should in any way be allowed to leave the inhabitants of a district in a dangerous position as regards fire protection. Indeed, to avoid this, they suggested that the main should be laid by the Board. They were not yet in a position to report fully on the general question; but, for the reasons set out, they recommended that the estimate of £400 to be submitted by the Finance Committee should be approved; that an expenditure not exceeding this amount should be authorized for the improvement of the water supply in Norman Road, Greenwich; and that a copy of the report should be forwarded to the County Council. In the course of the discussion which followed, the opinion was expressed that its approval would put upon the Board a grave liability; and, in the result, the report was referred back to the Committee.

THE PROTECTION OF WELSH WATER AREAS.

Modifications in the South Wales Water Bill.

At the Meeting of the Glamorgan County Council at Pontypridd last Thursday, the Chairman (Mr. J. Blandy Jenkins) moved, and the Vice-Chairman (Alderman T. J. Hughes) seconded, the confirmation of the resolution for the promotion of a Bill to empower the Council to make surveys with a view to the utilization of water supplies in South Wales, to form water districts, and for other purposes. Alderman Hughes remarked that the matter before the Council was one of supreme importance. The fact that the London County Council and the Metropolitan Water Board had both petitioned against the Bill was, in his judgment, the strongest possible reason why they should go forward with it; for unless these poachers across the border thought the Welsh preserves worth poaching upon, they would not take the trouble to incur the expense of petitioning against the Bill. There had been some misapprehension on the part of certain Urban District Councils as to the scope and intention of the measure; but at a friendly conference at Neath the previous Monday these misapprehensions had been largely, if not entirely, removed, and an arrangement made which would minimize the opposition, if it did not lead to the withdrawal altogether of the petitions which they had presented against the Bill. All the Bill was meant to do was to preserve and safeguard the interest of the mass of population in Wales against the inroads of the great boroughs and the municipalities outside. No urban area would incur a shilling in capital expenditure unless it asked to be included in a water area to be supplied. On the other hand, there were rural districts in the county, and some urban districts, which by themselves would not be large enough to incur the great cost of securing water from an area outside the coalfield. With a view to helping these districts, it was proposed that water areas should be formed here and there, where necessary; and the districts, of course, would have a voice in the matter. The Bill would enable half-a-dozen districts to do what it would be impossible for one district to do for itself. Mr. O. H. Jones asked what parts of the Bill it was proposed to withdraw or to modify. The Clerk (Mr. Mansel Franklen) said that the modifications made in the Bill would mean the exclusion of all counties except Monmouthshire. It was proposed to leave out all the powers to compulsorily include in a water area any urban authority in the county that had a population of more than 7000; and no area would be included that had not made default in supplying its own district with water. The motion was carried unanimously.

AFFORESTATION OF WATERSHED AREAS.

A considerable amount of interest is being taken at Bradford in the question of the afforestation of watershed areas; but opinions would seem to differ considerably on the subject. Some time ago, the Council recommended that an expert on afforestation should be asked to examine and report upon the water-works lands; but the Water Committee, after duly considering the matter, came to the conclusion that, as they had the fullest confidence in their own Engineer (Mr. James Watson), they ought not to be called upon to bear the cost of an expert. This decision led to a long debate in the City Council last Tuesday; Alderman W. Holdsworth, the Chairman of the Committee, leading off with the remark that at present the Corporation received an income of £3600 a year from their water-works lands, and that if afforestation were carried out, something like £10 an acre would have to be spent with absolutely no prospect in this generation of any revenue. He added that, in the interests of the ratepayers, the afforestation proposals should not be pushed—at any rate, so far as the Nidd Valley lands were concerned. He did not wish the Bradford Corporation to follow the example of Leeds, the success of whose experiment had yet to be proved. Dr. Duff, on the other hand, quoted the opinion of Mr. Margerison on the beneficial results of afforestation on water catchment areas; among those results being a profitable crop, an immense reduction in evaporation from the ground, reduction of the surface flow, and the increase of spring water. The Leeds Corporation were planting 851 acres in five years, and other authorities were proceeding with afforestation schemes. The timber supply of this country was being rapidly depleted; and the rain on exposed high-lying lands was gradually washing the soil down, and causing the land to become derelict. Mr. Roberts stated, on the authority of Dr. John Nisbet, that the planting of the land with trees could be carried out at from £6 to £8 per acre, and would bring a handsome return in 25 or 30 years. Mr. Land thought that sufficient had been done by the Council in working out problems for the benefit of posterity. In the present state of the municipal finances, he did not think it was reasonable to sacrifice an actual income for a problematical one 50 or 60 years hence. By a majority of more than two to one, however, the Corporation determined that the Water Committee should be instructed to take expert opinion upon the afforestation of the water catchment areas.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Eastern District of the Scottish Junior Gas Association spent an exceedingly profitable afternoon at their quarterly meeting to-day. For the first time since its institution, the Eastern District went outside their own ranks for matter—a step which I consider most appropriate. I have wondered that it has not been taken before; but, of course, there has been so much excellent material contributed by the members themselves that there has been no necessity to call in outside assistance. The Western District, it will be remembered, had a lecture this winter from a gentleman not a member—and a most instructive one it was. The lecturer this afternoon was a most happy selection. A Fellow of the Royal Society, who is accustomed to lecture, was certain to have something to say which would be worth hearing; and when Mr. O'Connor's acquaintanceship with gas matters is taken into account, expectation of a treat was converted into certainty. So it proved. Mr. O'Connor was altogether at home in such a subject as "Gas for Heating;" and he was able both to tell his hearers much that was new to them, and, what was better, to give reasons for the views he put forward. It may almost be said that a new vein has been struck in the suggestion that gas managers should pay more attention to the instruction of the people in the way to use gas for heating. This is a new burden laid upon the shoulders of the gas manager. Hitherto the duty has been undertaken by gas-stove makers. Now the manager is required to be an expert in burners, and is to know and advise people as to the colours to be adopted for fires and cooking utensils. These are most useful points, and are not difficult to encompass; and a little time devoted to them should bring a good return, in the popularizing of gas for heating purposes. The Association have every reason to be pleased with the communication which Mr. O'Connor made to them to-day. When we come to the paper by Mr. R. Webster, on "Gas as a Motive Power," the same must also be said. It was a very informative paper; and that it set the members thinking was shown by the tone of the few remarks which followed its reading.

As you will be having communications from other sources regarding the paragraph I wrote last week about the visit to the Dundee Gas-Works, and you are to be asked to correct the statement by saying that it was a private visit, let me point out that this was what I said. My paragraph is to be corrected; but I cannot see where it requires correction. Everything in it was correct, in point of fact, even to the assumption that it was a private visit. If any correction is to be made, it should be in the Dundee newspapers. I do not object to the visitors seeking to put themselves right with the readers of the "JOURNAL;" but I would just like to claim that my comment on the incident was not without justification. An association is a community; but when a section of the body in a particular locality organize themselves and go upon an expedition, unknown to the other members, association is dropped and dissociation begun—in short, the clique is introduced, and we know where that tends to.

Mr. M'Gilchrist has been appointed by the Town Council of Lanark to value the undertaking of the Gas Company there, with a view to a transfer.

The ratepayers of Uddingston met again on Thursday evening, to consider the subject of the gas supply. It was reported, on behalf of the deputation who were appointed at the recent meeting, that they were received by the Directors of the Company on the 7th inst., and that they laid before them the three points mentioned at the last public meeting—viz., the unexplained and universal rise in the gas accounts; the inferior quality of the gas; and the high price of it. Thereafter, it was said, the Chairman asked each individual member of the deputation what his particular grievance was, and then proceeded to read "a detailed statement evidently prepared most carefully before the deputation had arrived, and which contained the decision of the Directors." In this, it was explained that the Company had laid a new 12-inch main in place of an 8-inch pipe, which gave a greater volume of gas; and the increase in the consumers' bills could only be explained in two ways—either the fittings were defective, or the gas had been consumed. The Chairman of Directors also explained that the period charged for was from six to fourteen days longer than usual. Referring to a remark by one of the deputation, to the effect that the quality of the gas had apparently improved since the agitation was started, the Chairman gave that statement an emphatic denial. The illuminating power of the gas had not varied for years, and if sufficient light were not got from it, it was not due to any fault on the part of the Directors; and he declined to give any undertaking that the quality would be improved. As to the price, the Directors would most carefully consider the matter; but they had an expensive concern to keep up, with twenty miles of piping, five miles of which were absolutely unproductive; and at the present time he could intimate no reduction in the rate. At the meeting of ratepayers, it was complained that the Company had altered the conditions of supply without any intimation to the public. A resolution was adopted, to the effect that the matter be left in the hands of the Committee who had taken it up, and that, in the meantime, those who had not paid their bills should do so, forwarding, at the same time, a letter of protest, and reserving their right to recover in a future action. It was unanimously resolved to give support to an Electric Lighting Provisional Order, which is being promoted for the district. Is this letting the cat out of the bag? In the Sheriff Court at Hamilton yesterday, Mr. John Turner, one of the leaders in the agitation, presented a petition craving the Court to find that a demand note to pay for gas alleged to have been consumed per meter in his dwelling-house did not correctly detail the gas used by him, and asking interdict against enforcement of the demand; also interdict of the Gas Company interfering with his gas-meter and fixtures. The petitioner consigned the amount said to be due, and interim interdict was granted; the case being otherwise continued for hearing.

The Wishaw Town Council on Monday had before them a report by the Gas Manager with reference to the gas supply to the Craigneuk and Cambusnethan districts. He estimated that to lay new mains would cost £2900, but that part of this would be recovered through the value of the existing pipes. To meet possible requirements during the next 30 to 35 years in the Cambusnethan district, he considered there should be a 10-inch main. He recommended, however, that only the main in the Craigneuk district be laid this year. The Council approved of the report, and agreed that the work should be proceeded with immediately.

To judge by the difficulties which the Corporations of Falkirk and Hamilton have had to encounter in arranging for railway communication to the gas-works, the subject is surely one of more than ordinary stubbornness to deal with. At Hamilton, on Tuesday evening, the Town Council had before them the subject of the railway siding. The Gas Committee recommended that the work be proceeded with. After some discussion, the recommendation was carried by the casting vote of Provost Keith. Since then the opposition have resolved to requisition the Magistrates to call a special meeting of the Town Council, at which they intend to propose that the resolution be rescinded, and that a plebiscite of the electors in the Second Ward be taken; the Council to abide by the result.

In the Dundee Sheriff Court on Wednesday, James M'Williams, a mill worker, was charged with the theft of 2s. 6d. from a prepayment gas-meter in his house. The accused, it was said, cut the service-pipe, leaving the gas escaping; and he also did damage to the meter to the amount of 6s. 6d. M'Williams pleaded guilty. Sheriff-Substitute Campbell Smith did not impose a penalty, but continued the case for a week, in order to allow the accused to pay the damage caused to the meter, and to refund the money he had stolen.

The Electric Lighting Committee of the Edinburgh Town Council are endeavouring to secure a large extension to their business, through the medium of the lighting of common stairs. They had before them on Tuesday a report by their Engineer on the subject; and they agreed to offer to the Town Council to provide 5-candle power incandescent lamps on the same terms as are at present in force for lighting by gas—namely, 25s. per lamp per annum. If the Corporation should go the length of wiring the stairs, it would be an easier step than it is now to get the wires into the houses.

The Trustees of the Clyde Lighthouses have given up the use of electricity for the lighting of their Cumbrae lighthouse, and have substituted acetylene gas.

The undertaking of the Grangemouth Gas Company is to be transferred to the Corporation on the 16th of May. Negotiations with this object have been proceeding for some time. On Feb. 26 the Directors of the Gas Company and the Law and Parliamentary Committee of the Town Council met in conference; the desire being to arrive at an amicable settlement, and so to avoid the cost of arbitration. The Directors expressed their willingness to treat. After an exchange of views, the representatives of the Corporation retired, to allow the Directors to consider what had been said. On resuming, the Directors said they could not accept less than £29,000. This was more than the representatives of the Council were willing to give; and the conference came to an end without result. But on Tuesday, the 6th inst., another conference was held; the Corporation having, in the meantime, received a further report from Mr. J. M'Gilchrist, of Dumbarton, their adviser, as to the valuation of the concern. At this meeting the Corporation offered £28,500; and the Directors of the Company agreed to accept it. The offer includes house property which belongs to the Company. At first the Company asked £33,000.

At the Ayr Sheriff Court on Tuesday, Arthur Nolan a traction-engine driver, residing in Glasgow, was charged with taking a quantity of water from a street hydrant, without the consent of the Local Authority. He pleaded guilty. Sheriff-Substitute Shairp imposed a fine of £3, remarking that the practice must be put a stop to.

CURRENT SALES OF GAS PRODUCTS.

Week ending March 17.

There is little of interest to report in the London market for tar products. Inquiries for pitch continue to be received, and so soon as the labour difficulties among the colliers in the North of France are settled, it is expected that the value of pitch will improve. Crude carbolic acid, 60°, and benzol are in good demand at the last prices. Ordinary creosote is scarce, in consequence of recent large shipments. Sulphate of ammonia, while in better demand, has hardly improved in value to the extent anticipated. The price obtainable, on Beckton terms, is still about £12 10s. to £12 11s. 3d.

Sulphate of Ammonia. LIVERPOOL, *March* 17.

There has been steady demand throughout the week, and prices have been maintained; but makers have not been able to establish any further advance, there being still sellers abroad for near delivery at something under spot prices. The closing prices are £12 5s. per ton, f.o.b Hull, £12 6s. 3d. to £12 7s. 6d. per ton f.o.b. Liverpool, and £12 10s. per ton f.o.b. Leith. In the forward position further sales were, early in the week, reported at £12 7s. 6d. to £12 10s. per ton f.o.b.; but, later, buyers have become more reserved, and at the close £12 7s. 6d. probably represents the outside value, except at Leith, where £12 10s. might still be obtained.

Nitrate of Soda.

This article is firm in all positions, and spot prices remain 11s. 3d. to 11s. 6d. per cwt. for ordinary and refined qualities respectively.

Tar Products. LONDON, *March* 17.

There has not been much business doing during the past week, and markets generally have been quiet. In pitch, so far as early delivery is concerned, the depression still continues. There is a good deal offering for prompt shipment; while consumers are evidently holding off the market, their immediate requirement being fairly well supplied. The fear of a strike among the colliers in the North of France does not tend to improve matters. Business was reported during the week at 28s. and 28s. 6d. London by dealers; while on the East Coast 27s. and 27s. 6d. has been paid for March-June. There is still a fairly good inquiry from South Wales, but principally for delivery over the last six months of the present year, and the first six months of 1907. Manufacturers are, however, not particularly anxious to contract so far forward just at present. In Lancashire, the market continues quiet, and there is not much doing for prompt delivery. There is no actual business doing in anthracene, though there has certainly recently been a little more inquiry, more especially for forward delivery. Benzol is very quiet, and sales are reported in 90 per cent. at low prices, especially in the North of England. Toluol continues in very good demand, especially for immediate delivery. But prices are purely nominal, as makers have really nothing to offer. Solvent naphtha continues in good demand for March-April delivery; but consumers do not seem willing to contract forward at present, unless at a considerable reduction on existing prices. In carbolic acid, the market is firm at 1s. 9½d. for 60's; while in 75's a fair business has been done at 2s. 2d. f.o.b. As a rule, makers ask 1s. 10d. for 60's for forward delivery; but consumers do not seem prepared to pay this price just at present. In crystals, there is no change to advise, and the market remains in precisely the same position. Creosote is decidedly quiet, and there is very little business doing; while there are considerable quantities offering both in Yorkshire and Lancashire for early delivery. London makers have not altered their quotations, being evidently fairly well sold for early shipment; but so far as July-December is concerned, there is no business to report just at present.

The average values during the week were: Tar, 17s. to 21s. Pitch, London, 28s.; east coast, 27s.; west coast, 25s. Benzol, 90 per cent., 9½d.; 50-90 per cent., 10¼d. to 10½d. Toluol, 1s. 0½d. to 1s. 1d. Crude naphtha, 4½d.; solvent naphtha, 1s. 1d. to 1s. 2d.; heavy naphtha, 11¼d. to 1s. Creosote, London, 1⅞d. to 1⅞d.; North, 1⅞d. to 1 7/16d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 20s. to 21s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market has been steady during the past week, and there has been a fairly good business doing, with a decidedly improved inquiry for forward delivery. Beckton are not anxious sellers for prompt, but would accept £12 12s. 6d. for March-June. Buyers, however, are not prepared to pay more than £12 10s.; and even at this price they would not be likely to purchase large quantities. In Hull, there are buyers at £12 5s. for prompt; but makers ask £12 6s. 3d. for March-April. In Leith, further business is named at £12 10s. for forward delivery by some of the largest makers, though it is reported that dealers have accepted slightly under this for prompt shipment. In Liverpool, several parcels have been sold at prices varying from £12 5s. to £12 6s. 3d.; but the quantities were not large, and delivery was prompt.

Artesian Wells in London.—An artesian well has just been bored at Baltic House, in Leadenhall Street, and a good supply of pure water obtained. It is stated to be remarkable for its softness—being less than 6°. The well was carried to a depth of 450 feet, and beds of yellow, blue, and variegated clays, also sand and pebbles, were passed through before the chalk was reached. An electric borehole pump raises the water to the top of the building, at the rate of 2500 gallons per hour. Messrs. Alfred Williams and Co. were the engineers.

Sulphuretted Hydrogen in London Gas.—At the meeting of the County Council last Tuesday, the report presented by the Public Control Committee included a tabulated statement in regard to their legal proceedings. Among these were summonses taken out against the Gaslight and Coke Company in the last three months of the past year for supplying on seven occasions gas in which sulphuretted hydrogen was present. The Company appealed to the Chief Gas Examiner for the Metropolis (Lord Rayleigh, F.R.S.), who allowed the appeal, and the summonses were withdrawn. The South Metropolitan Gas Company were summoned for similar default on eight occasions; but they were fined £4, with £8 costs. The report was received.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 786.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21½—22½	..	4 13 4
160,000	10	,,	7½	Do. 7 p.c.	15—16	+⅛	4 13 9
200,000	5	Nov. 15	7	Bombay, Ltd.	6⅞—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	4¾—5¼	..	5 6 8
53,000	10	Mch. 9	14	Bourne- mouth Gas and Water } 10 p.c.	28½—29½*	..	4 14 11
51,810	10	,,	7	B 7 p.c.	16½—17½*	..	4 0 0
53,200	10	,,	6	Pref. 6 p.c.	15—16*	..	3 15 0
380,000	Stk.	Feb. 22	12½	Brentford Consolidated	260—265	..	4 14 4
300,000	,,	,,	9½	Do. New	192—197	..	4 16 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	123—128	..	3 16 11
206,250	,,	Dec. 14	4	Do. 4 p.c. Deb.	103—106	..	3 15 6
220,000	Stk.	Mch. 9	11½	Brighton & Hove Orig.	230—235*	+3	4 15 9
246,320	,,	,,	8½	Do. A. Ord. Stk.	163—168*	..	4 18 3
460,000	20	Sept. 28	10	British	43—44	..	4 10 11
100,000	Stk.	Feb. 22	6	Bromley, Ord. 5 p.c.	119—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	91—93	..	4 16 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12½—13	..	5 7 8
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
150,000	20	Mch. 9	8½	Cagliari, Ltd.	23—25*	..	6 12 0
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.	10—10½	..	4 5 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
50,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,443,280	Stk.	Feb. 22	5 5/16	Commercial 4 p.c Stk.	114—116	..	4 9 7
560,000	,,	,,	5	Do. 3½ p.c. do.	111—113	..	4 8 6
475,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	,,	6½	Continental Union, Ltd.	130—133	..	4 17 9
200,000	,,	,,	7	Do. 7 p c Pref.	143—148	..	4 14 7
424,070	Stk.	—	5½	Derby Con. Stk.	—	..	—
55,000	,,	—	4	Do. Deb. Stk.	—	..	—
486,090	10	Jan. 25	11	European, Ltd.	22½—23½	..	4 13 7
354,060	10	,,	11	Do. £7 10s. paid	16—17	..	4 17 0
15,223,235	Stk.	Feb. 8	4 5/16	Gas- light and Coke } 4 p.c. Ord.	93½—93½	..	4 8 5
2,600,000	,,	,,	3½	3½ p.c. max.	88—90	..	3 17 9
3,799,735	,,	,,	4	4 p.c. Con. Pref.	108—110	+1	3 12 9
4,193,975	,,	Dec. 14	3	Coke 3 p.c. Con. Deb.	88—90	..	3 6 8
258,740	Stk.	Mch. 9	5	Hastings & St. L. 3½ p.c.	98—102*	..	4 18 0
£2,500	,,	,,	6½	Do. do. 5 p.c.	121—124*	..	5 4 10
70,000	10	Oct. 13	11	Hongkong & China, Ltd.	20—21	..	5 4 9
3,800,000	Stk.	Nov. 15	10	Imperial Continental	233—235	..	4 5 1
473,600	Stk.	Feb. 8	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	123—128	..	4 13 9
561,000	Stk.	Feb. 22	10	Liverpool United A	234—236	..	4 4 9
718,100	Stk.	Feb. 22	7	Liverpool United B	165—168	+1	4 3 4
306,083	,,	Dec. 29	4	L'rpool Unit'd Deb. Stk.	109—111	..	3 12 1
75,000	5	Dec. 14	5	Malta & Medn., Ltd.	4¼—4⅜	..	5 5 3
560,000	100	Oct. 2	5	Met. of } 5 p.c. Deb.	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	104—106	..	4 4 11
541,920	20	Nov. 15	3½	Monte Video, Ltd.	11½—12½	..	5 12 0
1,675,892	Stk.	Feb. 22	4½	Newc'tle & G'tesh'd Con.	107—108*	..	4 5 8
406,025	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Mch. 9	10	North Middlesex 10 p.c.	18½—19½*	..	5 2 7
52,940	1	,,	7	Do. 7 p.c.	1⅝—1⅞*	..	5 3 8
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	149—152	..	5 5 3
600,000	5	Sept. 14	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	Apl. 28	6	Primitiva Ord.	7—7½	..	4 0 0
796,980	5	Jan. 25	5	Do. 5 p.c. Pref.	5⅛—5⅜	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
851,070	10	Oct. 13	7	River Plate Ord.	13—13½	..	5 3 8
300,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
250,000	10	Sept. 28	8†	San Paulo, Ltd.	14—14½	..	5 10 4
70,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50—52	..	4 16 2
135,000	Stk.	Sept. 14	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,498	,,	,,	10	Do. C	244—246	..	4 1 4
126,106	Stk.	Mch. 9	5½	Shrewsbury Ord. 5 p.c.	108—118*	..	4 13 3
70,000	10	Sept. 28	10	South African	16—17	..	5 17 8
6,250,000	Stk.	Feb. 22	5½	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,895,445	,,	Jan. 11	3	Do. 3 p.c. Deb.	88—90	..	3 6 8
575,000	Stk.	Mch. 9	5½	S'th Suburb'n Ord. 5 p.c.	120—123*	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	125—130*	..	3 16 11
112,533	,,	Jan. 11	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	Nov. 15	5	Southampton Ord.	109—112	..	4 9 3
120,000	Stk.	Mch. 9	6½	Tottenham and Edmonton } A 5 p.c.	124—127*	..	4 18 5
363,020	,,	,,	4½	B 3½ p.c.	99—102*	..	4 13 2
137,500	,,	Dec. 14	4	4 p.c. Deb.	105—107	..	3 14 9
182,380	10	Dec. 29	8	Tuscan, Ltd.	10—10½	..	8 0 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
30,000	Stk.	Feb. 22	7½	Wands- worth and } A 5 p.c.	—	..	—
255,636	,,	,,	6½	B 3½ p.c.	133—136	..	4 11 11
75,000	,,	,,	5 5/16	C 3½ p.c.	110—113	..	4 16 0
69,416	,,	Dec. 29	3	Putney 3 p.c. Deb. Stk.	82—85	..	3 10 7
745,872	,,	Mch. 9	5⅛	West Ham 5 p.c. Ord.	106—108*	+2	4 14 11
185,000	,,	,,	5	Do. 5 p.c. Pref.	121—124*	..	4 0 8
193,300	,,	Dec. 29	4	Do. 4 p.c. Deb. Stk.	103—108	+1	3 14 1

Prices marked * are "Ex. div,"

† Next dividend will be at this rate.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Reports from the various collieries in the county speak favourably of the trade as a whole. Full time is being worked at the pits. The demand for house varieties, except in the finer sorts, keeps up well, but stocks so far show little depletion. Engine fuel, of which slack forms the chief supply, is in good request, and is practically disposed of as fast as it comes to bank. Prices for slack are hardening; and as it is almost certain to be very scarce in the summer, more money will have to be paid for it. Gas coal and cannel are easing off a little in the general demand; but the process of gas making is ever going on, and new contracts in some districts are being arranged. Coal for bunkers in vessels on the Ship Canal meets with a rather better inquiry. Steady exports of coal are reported, chiefly for the Isle of Man and Ireland. Coke has a steady sale. Quotations at the pit are: Best house coal 13s. to 14s., secondary 10s. to 12s., common 9s. to 10s., steam and forge 8s. to 9s., best engine fuel 7s. 6d. to 8s. 6d, best slack 6s. 6d. to 7s. 6d., medium 6s. to 7s., common 5s. to 6s. Coal for shipping is 9s. to 10s.; and coke, delivered, varies from 15s. to 23s. per ton.

Northern Coal Trade.

There has been rather more animation in the coal trade of the North in the last few days, a sharper demand having set in for several quarters; but the stormy weather has delayed the shipments to some extent, so that the collieries have not been able in all cases to work full time. In steam coals, best Northumbrians are from 10s. 3d. to 10s. 6d. per ton f.o.b., second-class steams are 9s. to 9s. 6d., and steam smalls are 6s. For the two first kinds, higher prices are quoted for delivery over the season. In the gas coal trade the shipments have been fair for this time of the year, and prices for occasional cargoes do not show very much change—the quotation for Durham gas coals varying from 8s. 10d. to 10s. per ton f.o.b., according to the quality. One or two contracts have been made for gas coals for export to the northern ports; and for best qualities, the prices that are believed to be left, after the deduction of the estimated freight, are about 10s. per ton f.o.b. Not very much progress has yet been made with the larger contracts for the Metropolis—the margin between the buyers and sellers being still maintained. It is certain that some contracts have been concluded at advances of from 9d. to 11d. per ton; and on the average it is locally expected that the coals will be sold at an advance on last year's price of perhaps 10d. per ton. This, however, has no known official foundation. Coke is steadier; but gas coke is still abundant at the inland works, and prices do not show much change. Exports of gas coke, however, seem in some cases to be a little heavier.

Scotch Coal Trade.

There is no change in the situation. Demand continues to be steady; and the output—a very full one—is moving off freely. Ell coal is in specially good request, and is expected to be more so when the Baltic trade opens. Splint is in least demand. The prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 9d. to 9s. 6d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 231,658 tons—an increase of 5529 tons upon the previous week, and of 54,862 tons upon the same week of last year. For the year to date, the total shipments have been 2,206,701 tons—an increase of 83,778 tons upon the corresponding period of 1905.

"Electrical Explosion" at Leytonstone.

A local paper last week reported as follows on a serious inconvenience to which electricity users are subjected and gas consumers are not: "About 8 o'clock on Sunday evening, an explosion occurred at one of the Leyton Council's electric light mains at the corner of Harold Road in Vernon Road, through the fusing of the wires. The pavement was broken and a portion of it hurled into the air, and considerable alarm was created among the residents by the untoward mishap. Fortunately no one was injured. The explosion caused great inconvenience throughout the district; and the light in several places of worship went nearly out. In a number of houses where no gas is laid on, the residents had to make shift with candles and wax tapers; and it is stated that where no effort was made to procure these articles, the incident was made the excuse for retiring early to bed, more especially as, when the work of remedying the defect was proceeded with, it was necessary to temporarily cut the light off altogether."

Gas Charges and Profits at Blackpool.

A Special Sub-Committee appointed to go into the question of gas charges at Blackpool, have been considering a statistical report compiled by the Borough Treasurer and his staff. The document was explained to them by Alderman Heap, who contended that the Gas Department ought to contribute a minimum of £15,000 every year to the relief of the rates, and that any contemplated reduction in the price of gas should only be taken out of what was realized in excess of this sum. It is stated that, as a result of the report and discussion, one or two members who had previously supported the claims for concessions to gas consumers wobbled; and ultimately the Sub-Committee decided to recommend that it would not be advisable to reduce the price of gas to the ordinary consumers. It was, however, agreed that the users of coin-meters were being unjustly treated; and it was therefore decided to recommend a reduction on their behalf to 2s. 11d. per 1000 cubic feet. It was also determined to try and increase the output for motor purposes by reducing the price to 1s. 10d. to such users.

Fire Risks of Electric Wires.—A fire which broke out in County Chambers, Cornhill, last Thursday evening, is reported to have been caused by the fusing of some electric light wires on the top floor. The outbreak was, however, quickly extinguished.

CARBURETTED WATER-GAS APPARATUS

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Buffalo, N.Y.	2,000,000	Newcastle-on-Tyne	1,800,000
Windsor St. Works, Birmingham	2,000,000	Winnipeg, Man.	500,000	Leeds	1,800,000
Saltley Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Malton	150,000
Colchester	300,000	York	750,000	Smethwick	500,000
Birkenhead	2,250,000	Rochester	500,000	Gravesend	300,000
Swindon (New Swindon Gas Co.)	120,000	Kingston, Ont.	300,000	Pernambuco, Brazil	125,000
Saltley, Birmingham (Second Contract)	2,000,000	Crystal Palace District	2,000,000	Duluth, (Second Contract)	300,000
Windsor St., Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Leicester (Second Contract)	1,000,000
Halifax	1,000,000	Caterham	150,000	Newport (Second Conttract)	250,000
Toronto	250,000	Leicester	2,000,000	Brockville	250,000
Ottawa	250,000	Enschede, Holland	150,000	Toronto (Third Contract)	750,000
Lindsay (Remodelled)	125,000	Buenos Ayres (River Plate Co.)	700,000	Montreal, Ont. (Second Con.)	1,800,000
Montreal	500,000	Burnley	1,500,000	Toronto (Fourth Contract)	1,000,000
Toronto (2nd Cont., Remodelled)	2,000,000	Kingston-on-Thames	1,750,000	Hamilton, Ont.	400,000
Belleville	250,000	Accrington	500,000	Rochester (Third Contract)	1,600,000
Ottawa (Second Contract)	250,000	Tonbridge	300,000	Leeds (Second Contract)	900,000
Brantford (Remodelled)	200,000	Stretford	500,000	Buenos Ayres (Primitiva Co.)	1,200,000
St. Catherines (Remodelled)	250,000	Oldbury	300,000	Buenos Ayres (New Co.)	1,200,000
Kingston, Pa.	125,000	Todmorden	500,000	Christchurch, N.Z.	300,000
Peterborough, Ont.	250,000	Saltley, Birmingham (Third Contract)	2,000,000	Rochdale	1,600,000
Wilkesbarre, Pa.	750,000	York (Second Contract)	750,000	St. John's, Newfoundland	250,000
St. Catherines (Second Cont.)	250,000	Rochester (Second Contract)	500,000	Brantford (Second Contract)	400,000
		Newport (Mon.)	250,000	Smethwick (Second Contract)	500,000
		Tokio, Japan	1,000,000	Pontypridd	250,000
				Montreal (Third Contract)	1,800,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

An Answer to a Recent Report on Gas-Lighted Trains.

The Fire Brigade Committee of the London County Council will to-day direct the attention of that body to a fire which occurred on an electric train which was proceeding through an open cutting between South Kensington and Sloane Square Stations on the District Railway. "The fire," it is stated, "broke out on the under side of one of the carriages, and it was some little time before the flames were extinguished. Quantities of smoke entered the carriage, and caused considerable anxiety to the passengers. The electric lights in the carriages were extinguished, and no other means of lighting appeared to be immediately available. So far as is known, no fire-extinguishing appliances were available on the train. This is the second case within our knowledge of a fire occurring on a train on this railway since the adoption of electric traction; and we recommend that the attention of the Board of Trade be drawn to the lack of suitable arrangements for dealing with outbreaks of fire on the District Railway."

Gas Companies as Gas-Fitters.

The writer of "Trade Chat" in the "Ironmonger" tells a story in the current issue which, if not an exaggeration, will not tend to inspire confidence in gas companies who undertake gas-fitting work. A friend who was changing his residence placed the whole of this work in the hands of the local gas company, whose estimate was much lower than that of the private fitter. The writer remonstrated with him, but without effect; the friend saying that, in justice to himself, he was bound to "brush sentiment aside and accept the lowest tender." Thereupon the writer left him severely alone for a time, and awaited developments. It seems that they were not long in showing themselves. The "moving" was in full swing last week; and the gas company's men held "high revel," in accordance with the spirit of the occasion. We leave the writer to tell the story of his friend's rude awakening: "Instead of following the householder's instructions to remove certain fittings and leave others intact, the whole lot were taken down and removed to the new house; but, instead of setting to work and refixing them, the men contented themselves with dumping the materials on the floor and disappearing for the entire day. The result was that my friend had no gaslight at either house for about 36 hours. So far as can be ascertained, these precious workmen only did about an hour's work on the day the fittings were removed—a trifling circumstance which was only discovered in an accidental manner. My friend is sorry now that he did not go to work in an orthodox way. He is emphatically of the opinion that though some gas companies' fitting work may be cheap, the lack of supervision which prevails discounts any apparent advantage which might otherwise accrue; and he is not having any more of it." If there are any other gas companies whose methods of work are similar to those described, it would be well, for their own credit and that of the industry to which they belong, to forthwith introduce some necessary reforms.

Improperly Laying a Pipe to Convey Gas.

Last Thursday, Charles Griffiths, a laundryman, was charged at the Bradford City Police Court with laying a pipe to convey gas without the consent of the Corporation, and with allowing the pipe to remain for twelve days thereafter. Mr. Fleming, who prosecuted, said he wished defendant to be dealt with on the second charge only. He explained that a gas inspector visited the premises in question, to see if the meter was in working order; and it was then discovered that the connections had been tampered with. Only 400 cubic feet of gas had been registered for the preceding forty days; and it subsequently transpired that defendant had arranged a pipe in such a manner that a supply of gas could be obtained without it going through the meter. It was quite by chance the inspector found the pipes had been so connected, as it was very cleverly effected. Mr. Fleming pointed out that by the Act prohibiting the offence, a man could be fined 40s. for each day on which he had received the gas in this unlawful manner. The defendant stated that he had had an explosion, and laid the pipe down as a kind of makeshift. He eventually admitted the charge, however, and was fined 24s. (2s. a day), and 7s. costs, or seven day's imprisonment in default.

Camberwell Borough Council and South Suburban Gas Bill.

The Committee of the Camberwell Borough Council to whom was referred the letter of Sir George Livesey on the subject of the opposition of the Council to the Bill of the South Suburban Gas Company, as recorded last week (p. 755), have presented their report. They say they learn from the Parliamentary Agents acting on behalf of the Borough Councils who are opposing the Bill that the statements made on behalf of the Company are not borne out by the evidence given before the Departmental Committee of the Board of Trade; it being conclusively shown that with every reduction in illuminating power there must necessarily be an increased consumption of gas to get the same benefit. They also report that, although the Company state that the whole of the saving from the abolition of enrichment will go to the consumers, this is not proposed by the Bill as it now stands; and assuming that the proposed reduction will enable the Company to sell their gas 2d. per 1000 cubic feet cheaper—that is to say, at 2s. 4d. instead of 2s. 6d. per 1000 cubic feet—the Company will be able to increase their dividend to £5 13s. 4d., against the dividend of £5 10s. which they are at present entitled to distribute. The Committee add that the London County Council also recommend that the opposition to the Bill should be continued. The Committee say they have gone carefully into the whole of the facts submitted to them in regard to the matter, and, being of opinion that the Council should continue to oppose the Bill, in conjunction with the other Borough Councils concerned, they have instructed the Town Clerk accordingly. The Bill is not likely to reach the Committee stage till after Easter.

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Wages of Birmingham Gas-Works Labourers.—The gas-works labourers at Birmingham are, it is reported, making arrangements for an application for an increase of wages; the present minimum rate being 23s. a week. What is desired is an increase of 2s. a week, bringing the minimum up to 25s. It is pointed out that in some of the other large industrial centres gas-works labourers are paid above the Birmingham scale, though so far as the stokers, &c., are concerned the wages in Birmingham are as high as anywhere.

Llandrindod Wells Gas Bill.—On Tuesday a meeting of the ratepayers of Llandrindod Wells was held to consider the Bill which is being promoted this session for the incorporation of a Company for the construction of works and the supply of gas in the district. The Gas Company had previously met the wishes of the Council on several points; and the only questions at issue as between the Council and the Company had reference to the maximum price to be charged for gas and the limitation of dividend. The Company proposed 4s. 6d. per 1000 cubic feet as the maximum charge; and they offered to share the dividends with the ratepayers after 8 per cent. The Urban District Council sought a reduction to 4s. per 1000 feet, and the limitation of the dividend to 7 per cent.; but the Council were not unanimous on these points. The matter was argued at great length by the meeting. The voting was taken by ballot; and the result was: For opposition being proceeded with, 65; against, 71. A poll was demanded.

Cartagena Water Supply.—The statutory meeting of the Cartagena (Colombia) Water-Works, Limited, was held at the London Offices of the Company last Tuesday, under the presidency of Professor William Galloway, F.G.S., in the absence of Sir Simeon Stuart, the Chairman. In moving the adoption of the report, the Chairman said the whole of the capital had been subscribed, and 12s. 6d. paid up on each share. The concession now owned by the Company was granted by the Government of the Department of Bolivar, and confirmed by the President of the Republic of Colombia. It conferred the exclusive privilege or monopoly for a period of fifty years—*i.e.*, until 1955—for the construction of aqueducts, the building of reservoirs, and the laying of mains for the supply and distribution of potable water to the city of Cartagena and its suburbs, with a population of 30,000 inhabitants. It had been purchased from the vendors at the agreed price of £55,000, and had been duly assigned to the Company, together with contracts made by the vendors with the Cartagena and Magdelena Railway Company and the Cartagena Terminal and Improvement Company for wayleaves, easements, and other facilities for the construction and working of the concession, which was included in the purchase price. The cost of preliminary expenses was *nil*; the vendors having undertaken, under the contract, to defray all these expenses. The water would be taken from springs situate near the railway, at points 8 to 10 miles distant from the city and about 300 feet above its level, which produced a constant supply of good, clear drinking water. The Government had undertaken to purchase and transfer to the Company, free of cost, all the land required for their purposes, and also to secure to them the right to take the water from the springs free of cost.

Production of Sulphate of Ammonia in Germany in 1905.—The "Chemical Trade Journal" says that, notwithstanding the strike in the Bochum district at the beginning of 1905, the production of sulphate of ammonia in Germany made large strides in the year. The output of the Consolidation Collieries and Coke Company was 3891 tons, against 3590 tons in 1904; and that of the Nordstern Company 3602 tons, against 3208 tons. With the present phenomenal activity in the coal and iron trades, and the constant addition to the number of ammonia-recovery coke-ovens, the rate of increase in the production of the bye-product named will, no doubt, become even more rapid. Our contemporary says this is one of the factors in the weakness of the market for the fertilizer.

Wandsworth Borough Council and the Sulphur Question.—At the meeting last Wednesday of the Wandsworth Borough Council, the General Purposes Committee reported that a Sub-Committee had had an interview with the Chairman of the Wandsworth and Putney Gas Company on the subject of the Bills promoted by the Company and other gas companies with the object of obtaining the removal of the sulphur restrictions. Having gone fully into the matter, the Committee recommended that they should be authorized to settle the draft clauses which the Company are willing to insert, to authorize the Council's Gas Examiner to make testings of the Company's gas for the purpose of ascertaining its calorific power, its purity as regards sulphur other than sulphuretted hydrogen, and its illuminating power as ascertained by means of a flat-flame burner to be prescribed by the Metropolitan Gas Referees; also the provisions as to the hours during which tests may be made, and as to the Company giving notice before any of their officers or servants go to the testing-place for the purpose of clearing out the pipes connected with the apparatus. The recommendation was adopted.

Failure of the Electric Light at Rhyl.—A proof of the inconvenience that is apt to attend the sole use of electricity as a lighting medium was experienced last Wednesday at Rhyl, when those places dependent upon the local electrical supply were suddenly plunged in darkness—the cause of the breakdown being unknown. Fortunately the side streets are illuminated by gas-lamps, and were not affected; but all parts of the town were not so lucky. At the Town Hall, the greatest inconvenience was, it is said, experienced for a time. A large number of ladies and gentlemen were attending the ball of the Advertising Association, when suddenly the electric lamps flared up with great brilliancy, and then failed. The stewards promptly struck matches and sent for candles; while others succeeded in lighting the gas-standards in the ceiling, and the ball proceeded. The refreshment departments and ante-rooms were lighted for the remainder of the night by candles. At the Post Office, the mails were on the point of being despatched when the current failed; and here also candles were requisitioned. At Christ Church, a Committee was sitting; and the meeting was abruptly ended. This is only a part of the inconvenience that was caused by the occurrence.

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London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington, &c.

Lighting Contract at Midsomer Norton.—The Midsomer Norton Urban District Council have resolved to enter into a contract with the Gas Company for the lighting of the town for a period of six years (including the present season); the price for gas being 4s. 3½d. per 1000 feet, subject to a rise or fall, according to the price paid for coal by the Gas Company. The increase and decrease are to be upon the following basis: One shilling per ton of coal to be equivalent to 1d. per 1000 feet of gas; the price to be adjusted at the end of each season, and the hours of lighting to be as before. The Solicitor's costs in the dispute that has taken place between the parties are to be added together, and equally divided.

Compensation for the Devonport Explosion.—The Devonport Corporation Gas Committee had under consideration last Wednesday claims for compensation for the damage caused by the explosion of gas an account of which has already been published in the "JOURNAL" (p. 745). The Committee decided, subject to confirmation by the Town Council, to pay the sum of £2546, which was the amount claimed on the basis of the valuation for insurance purposes. This included £556 for repairs to premises, £1570 for damage to, and destruction of, stock, £350 for loss of profits through suspension of business, and £70 compensation to two assistants who were injured. The £2546 will be taken from the reserve fund of the gas account.

Water Scheme for Alfreton.—After long consideration of different schemes, the Alfreton Urban District Council have decided (in consultation with Mr. W. H. Radford, of Nottingham) to spend about £15,000 on improving and increasing their storage at Lindway, and laying down new mains. At the meeting at which this determination was come to, the Water Committee reported that they commended the adoption of Mr. Radford's scheme for the enlargement and making sound of the Lindway reservoir at an estimated outlay of £11,500, and the laying of a main from Butterley to Lindway at a cost of £1430—making a total of £12,930. The wayleaves, engineer's expenses, &c., would, it was explained, bring the cost up to the £15,000.

New Water-Works for Milton.—The Milton Urban District Council have, at a cost of nearly £13,000, erected water-works at Highsted, near Sittingbourne; and they were formally opened a few days ago by Mr. F. Littlewood, the Chairman of the Council, who after the ceremony entertained the members of the Council and visitors to lunch. The water (of which there is an abundant supply) is pumped from the chalk into a reservoir situated on the hill top, by means of two Diesel oil-engines, each of 20-horse power. Each pump lifts 16,000 gallons an hour; but it is found necessary to employ only one at a time. The water-works, which are said to be about the cheapest in the country, are self-contained and well built. The cost to supply 1000 gallons is only 1·7d., inclusive of capital and other charges; and there is sufficient water for a population five times larger than that of Milton. The works have been constructed under the direction of Mr. G. F. Deacon.

New Filter-Beds for Accrington.—New filter-beds in connection with the water-works of the Accrington District Gas and Water Board were lately opened by the Chairman (Mr. Dewhurst), the Manager (Mr. C. Harrison), and other officers. The filters—which are at the foot of the two Mitchells reservoirs—consist of two brick tanks, 105 feet long, 70 ft. 6 in. wide, and 9 feet deep when empty; and the covered reservoir attached to each is 70 feet long, 33 feet wide, and 11 feet deep. The capacity of each filter-bed is 370,000 gallons, and of each reservoir 158,000 gallons—a total of 1,056,000 gallons. The water, on leaving the reservoirs, passes through the balance-valve tank into the filters through the sand and gravel, in layers of 1 foot very fine sand on the top, 2 feet rough sand, 1 foot gravel in three sizes—4 inches small, 4 inches medium, and 4 inches large—when the false bottom is reached, consisting of brickwork laid open to drain off the water and convey it to the main outlet.

Borrowing Powers for Electric Lighting Refused.—The Local Government Board have informed the Tiverton Town Council that they cannot sanction the proposal of the Council to borrow £13,000 for the installation of electric lighting in the borough. The Corporation obtained a Provisional Order as long ago as 1890; but, in view of the fact that they have since acquired possession of the gas-works, and of the opposition which has been offered to the introduction of electric lighting, on the ground that it would probably prove unremunerative, no action has been taken until recently to put the Order in force. A large number of people in the town were opposed to the Corporation incurring the risk of such an undertaking; and the announcement of the Local Government Board's decision will give satisfaction to many of the ratepayers, including some who have supported the later developments of the scheme because they thought it right that the town should endeavour to fulfil the obligations which it had incurred. It is anticipated that the Corporation will now turn their attention to the extension of the gas-works, proposals for which have been in abeyance pending the decision of the Local Government Board with reference to the electric light.

Bognor Water Company.—The Directors of this Company state in their report for the past year that the income from water-rentals shows an increase of £304 on that of the preceding twelve months, and a profit on the year's working of £2614, against £2305. After payment of interest on the debenture stock, the net available profit for the year (with the balance of £573 brought forward) amounts to £2869, with which the Directors propose to deal as follows: In October last they distributed interim dividends at the rate of 5 per cent. per annum on the preference shares and at the rate of 7½ per cent. per annum on the ordinary shares limited to 10 per cent., and its equivalent of 5¼ per cent. per annum on the ordinary shares limited to 7 per cent. They now propose to pay the balance of the year's dividend at the rate of 5 per cent. per annum on the preference shares, a further dividend at the rate of 10 per cent. per annum on the former class of ordinary shares, and its equivalent at the rate of 7 per cent. per annum on the latter class; making the total dividends for the year 8¾ per cent. on the ordinary shares limited to 10 per cent., and 6⅛ per cent. on those limited to 7 per cent. These, with the interim dividends paid, will absorb the sum of £2053, and leave a balance of £816 to be carried forward.

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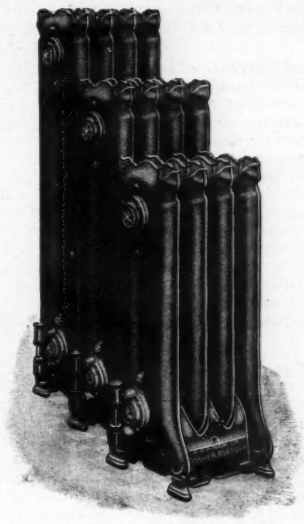
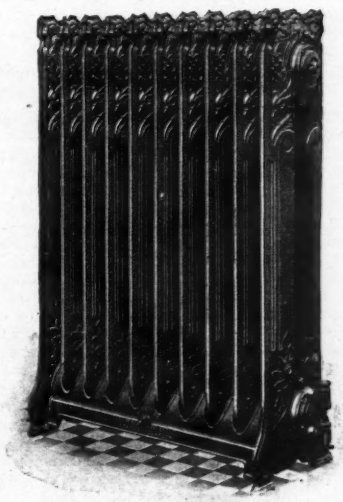
"ST. MUNGO"

Gas-heated

STEAM RADIATORS.



Plain Design.



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Suffocation by Gas at Birkenhead.—Four youths, about 16 years of age, retired at night to sleep in a Birkenhead lodging-house, and next morning, as groans were heard, an investigation was made, when all four were seen to be lying about the room. One, unhappily, was dead; but the others recovered on removal to the hospital. It is stated that the gas-pipe in the room had been recently cut, and knocked up with a hammer. The gas had escaped; and there was no outlet for the fumes, the windows all being tightly closed.

The Reduction in Price at Manchester.—The reduction in the price of gas for manufacturing purposes at Manchester, notified last week (p. 755), has already led to some correspondence in the local Press on the subject of the cost of gas-fires. Writing to the "Manchester Guardian," Mr. H. H. Clegg, an architect, says: "I am pleased to see that our Corporation are considering the question of gas-rates. Many of my clients have of late years asked my advice as regards the fixing of gas-fires. In the past I have been compelled to advise against their use, owing to the price charged for the gas. I would now suggest to the Gas Committee, through your medium, that they supply gas-fires at power-gas rates. The city would obtain great advantage, not simply from the larger sale of gas from their works, but from the increased cleanliness of the atmosphere, as our buildings are constantly being depreciated by the smoke sent out from the domestic fires."

Price of Gas at Bitterne.—The Bitterne Parish Council have sent a petition to the Southampton Gas Company, in which they called attention to the fact that the Company were supplying gas to consumers in Southampton at the rate of 2s. 10d. per 1000 cubic feet, while consumers at Bitterne were charged at the rate of 3s. 4d.; and that the Company were paying the full dividend, and had added a surplus to their reserve fund. They submitted that the high charge for gas rendered it difficult for the Council to suggest the public lighting of the streets and highways; and the uncertainty of the future price of gas also precluded all possibility of lighting the thoroughfares at the public expense. They suggested that the price of gas supplied to consumers of Bitterne should be assimilated to the rate paid in Southampton—more especially as they understood that in a portion of Bitterne parish annexed lately to Southampton, the consumers were charged 2s. 10d. per 1000 cubic feet, and not 3s. 4d., which the rest of the parish was required to pay.

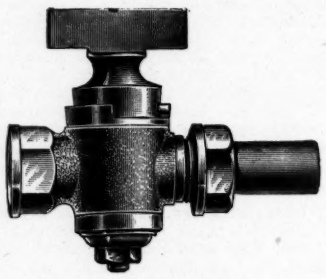
Free Gas-Cookers at Oldham.—Some of the members of the Oldham Town Council have been seeking information on the subject of free cookers. Mr. Ward was desirous of knowing whether the Gas Committee were prepared to give figures as to extra revenue obtained through the installation of free gas-cookers to householders; and he also wanted to know whether the Committee had considered the legal aspect of the question of landlords suing the Corporation for compensation in damaging property by fixing up the cookers. Mr. Isherwood asked what capital had been expended on cookers. He noticed £44 appeared in the accounts for cookers for last month; and, as no rent was charged for them, it was very important that the consumption of gas should be increased to counterbalance the outlay. In reply, Alderman Hanson said the amount spent on cookers might appear large; but it must be remembered that during the last twelve months the consumption was estimated to be quite a million cubic feet more than it was last year, or prior to the introduction of the free cookers. The Council would see that the Committee were warranted in supplying them. The legal aspect of the question had not been considered; but he would bring it up before the Committee.

Price of Gas to Manufacturers at Bolton.—A Bolton firm having applied for a reduction in the price of gas for manufacturing purposes, a member of the Town Council asked the Gas Committee whether their reply was in the negative or the affirmative. If the former, he thought it was rather a short-sighted policy. A step in the right direction would be for the Gas Committee to encourage the use of gas by manufacturers. Such a policy as not to differentiate between gas for household and for trade purposes had the effect of driving trade out of the town. In Manchester, during the past five years, the Committee had made three reductions in the price of gas to manufacturers. He believed that in Bolton there was a large field that might be tapped for the consumption of gas for such purposes, with a good resultant revenue. Alderman Wild said the reply to the firm was neither in the negative nor the affirmative. The whole question would be gone into by the Committee after the end of the month, when the contracts had been considered for the new year. Alderman Haslam said he had previously supported a reduction in the price of gas for manufacturing purposes, and he did so again. Their make was declining, and every opportunity ought to be taken to encourage and not discourage this class of trade, which would increase both the consumption of gas and the labour required.

Lecture on Coal-Tar Products.—During the spring term at the Stockton Grammar School, a course of lectures has been given in aid of the games and library fund; and they were brought to a close on the 9th inst. by a discourse by Mr. Matt. Dunn, the Assistant-Manager at the gas-works, who took for his subject "The Products of Coal and Coal Tar." It was a continuation of a lecture he gave last year on "Gas Manufacture." After dealing with the process of the carbonization of coal, Mr. Dunn said that from the year 1860 it might be considered that the manufacture of coal-tar products had been raised into a distinctly scientific industry. At the present time, so far as could be ascertained, there were about 150 bodies of different identity actually present in coal tar; and he exhibited about 110. He said it was fair to assume that there were others existent, but not in a state of sufficient chemical purity to warrant their inclusion in any authoritative list. Outlining the process by which crude tar was converted into the products from which the subsidiary industries prepared their specialities for trade purposes, Mr. Dunn illustrated his remarks by a model apparatus and lantern slides. He pointed out that, by means of distillation, the valuable bodies were extracted from which were obtained benzene, toluene, naphtha, carbolic acid, creosote, anthracene, and naphthalene; these being the parent constituents from which were derived the various other products.

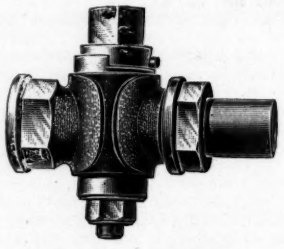
MAIN TAPS.

No. 119.



ROUND GASWAY.

No. 61.



OBLONG GASWAY.

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AND SAMPLES.

SAWER & PURVES,
MANCHESTER & NOTTINGHAM.

Cheaper and Better Gas at Ebbw Vale.—According to a paragraph in the "Merthyr Express," the assumption by Mr. W. Valon Watson of the management of the gas-works at Ebbw Vale has been attended by very beneficial results. An announcement has been made that, as from the 1st prox., the price of gas used for lighting purposes will be reduced from 4s. to 3s. 9d. per 1000 cubic feet, and that a further reduction of 3d. will be made on the 1st of October. During the past six months, there has been a great improvement in the quality of the gas supplied to the town; and the prospective reductions in price cannot fail to lead to greater appreciation of the value of gas, not only for lighting, but for culinary and heating purposes.

Ilford Gas Company.—The Directors of the Ilford Gas Company report as the result of the working in the past half year that, after providing for the interest charges, there remains on the profit and loss account an available balance of £6382; and they recommend that a dividend be declared at the rate of 6 per cent. per annum on the "A" and "C" stocks, and of 4½ per cent. per annum on the "B" stock (less income-tax). The Directors say they made every effort to establish the immunity of the Company from liability in respect of the flood of 1903; and they report that in respect of claims for £20,672, besides a large amount of general damages, £3002 has been accepted or awarded in discharge. This, however, resulted in heavy law costs; it being absolutely necessary that such extravagant claims should be vigorously fought. There are outstanding undefined liabilities and claims in respect of the flood; but the Board have reason to think that the more serious of these have been disposed of, and that the remaining liabilities will be satisfied without endangering the ability of the Company to pay their usual dividends for the current year.

The Chemical Engineering Company and Wilton's Patent Furnace Company have received an order from the Aldershot Gas and Water Company for one of their patent ammonia liquor stills, complete with fittings and superheater.

The Dumbarton Gas Corporation have placed an order with Messrs. R. Dempster and Sons, Limited, of Elland, for eight settings of eight retorts, with Waddell's patent regenerators, complete with retort-mountings, stage-floor, chimney, hydraulic hoists, &c.

At the annual general meeting of James Milne and Son, Limited, last Friday, the Directors reported that, while the volume of business had been well maintained, the continued rise in the price of metals had, by diminishing the selling margin in the face of keener competition, reduced the balance of profit below that for the year 1904. The Directors had been alive to the necessity of reducing costs; and much had been done during the past year in this direction, apart from the addition of labour-saving tools, which with the return of better times would, they felt assured, produce improved results. The net profit, after meeting all the charges of the business, providing for depreciation, and including the balance brought forward, amounted to £5154, from which they recommended payment of a dividend of 5 per cent. on the preference shares, amounting to £4750; leaving a balance of £404 to be carried forward.

The report which was submitted at the sixth annual general meeting of the Davis Gas-Stove Company, Limited, last Wednesday, stated that the net profits for the year to Dec. 31 amounted to £17,224, to which had to be added the amount brought forward from 1904—£5264, giving a total divisible profit of £22,488. Deducting from this the dividend on the 5½ per cent. preference shares for the year, and the interim dividend on the ordinary shares at the rate of 10 per cent. per annum for the half year to June 30, amounting together to £6234, there remained a balance of £16,254, which it was proposed to apportion as follows: £2968 to pay a further dividend on the ordinary shares at the rate of 10 per cent. per annum (less income-tax) for the half year up to Dec. 31, making 10 per cent. for the year; £6000 to be added to the reserve account; £803 due to Directors and Managers (less income-tax); and to carry forward £6482. In moving the adoption of the report and accounts (which was agreed to), the Chairman—Mr. H. J. Davis—pointed out that a larger dividend could have been paid; but believing that a sound and prosperous business could only be built up by a cautious and prudent policy, the Directors thought it wise to limit the distribution to the amount named. There was a slight falling off (though nothing very serious) in the gross profits, owing to the fact that they were unable to secure the prices they formerly did for a certain class of manufactured goods. Referring to the progress of the works at Luton, he said that ultimately the Company would have in that locality a foundry second to none; while the value of the freehold was bound to increase.

APPLICATIONS FOR LETTERS PATENT.

5283.—Bray, J. W., "Bunsen burners." March 5.
5308.—Thwaite, B. H., "Gas-engines." March 5.
5320.—Meyersburg, G., "Gas-motors." March 5.
5328.—Hillis, R. & W. J., "Gas-governor." March 5.
5344.—Anderson, D., "Incandescent burners." March 5.
5375.—Fiddes, W. W., and Aldridge, J. G. W., "Discharging coke from, and charging coal into, gas-retorts." March 5.
5391.—Atkinson, J., "Gas-engine indicators." March 6.
5515.—Roberts, F., "Gas-turbines." March 7.
5615.—Smith, F. J., "Gas-burners." A communication from R. Swimmer and E. B. Neelen. March 8.
5666.—Turner, W., "Washing gases." March 8.
5684.—M'Intosh, J., "Incandescent gas-lamps." March 9.
5714.—Proskauer, M., and Proskauer & Co. G. m. b. H., "Inverted lamps." March 9.
5731.—Dixon, L., "Gas-regulator." March 9.
5775.—Johnson, J. Y., "Production of ferrocyanides from cyanogen contained in gases." A communication from W. Feld. March 9.
5776.—Johnson, J. Y., "Production of nitrate of ammonia." A communication from W. Feld. March 9.

"CROWN" COOKER

SHOWING HOT-PLATE HINGED TO FACILITATE CLEANING OF BURNERS, &c.

PARKINSON'S

No. 840 LANTERN.

Wind-Proof and Perfect Ventilation.

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PARKINSON AND W. & B. COWAN, LTD.
(Parkinson Branch),
Cottage Lane, City Road, LONDON.
Bell Barn Road, BIRMINGHAM.

Orders have recently been placed with Messrs. Clapham Bros., Limited, of Keighley, for four purifiers, each 12 feet square, complete with their patent "Eclipse" rubber jointing, for the Berkhampstead Gas Company; 1520 feet of similar jointing, with rapid automatic fasteners, for new purifiers at Manchester; washer-scrubbers for Inchicore, Ireland, and the Ferndale Gas Company; and retort-fittings, floor girders, and buckstays for the Neepsend works of the Sheffield United Gas Company.

Messrs. Bryan Donkin and Clench, Limited, have received from the Croydon Gas Company an order for two exhausters, each to pass 180,000 cubic feet of gas per hour, together with two compound "Farey" engines, valves, and regulators; also for two exhausting plants, each to pass 150,000 cubic feet per hour, with engines, for the Stockholm Corporation Gas-Works. The firm have exhausters in hand for Wandsworth, Wellington, Chepstow, Auckland, Great Berkhampstead, Porthcawl, Coleshill, and other places.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT MANAGER. No. 4575.
WORKING MANAGER. Rothwell Gas Department. Applications by April 1.
HEAD CLERK. Nuneaton Gas Works.
FITTER AND MAIN AND SERVICE LAYER. Dorking Gas Company.
LEAKAGE DETECTER, &c. No. 4570.

Situations Wanted.

INSPECTOR DISTRIBUTION DEPARTMENT. No. 4573.
SALESMAN, BOOKKEEPER, COLLECTOR, &c. D., 18, Ferndale Avenue, Walthamstow.
OUTDOOR REPRESENTATIVE. "B.," Islington.

Plant (Second-Hand), &c., for Sale.

ENGINE AND PUMPS, LIQUOR TANKS, &c. Whitehouse's Executors, Ilkeston.
GASHOLDER AND TANK. Gas Works Supplies and Construction Company Limited.
GASHOLDERS AND TANKS. Cowdenbeath Gas Company.
RETORTS, MOUTHPIECES, ASCENSION, &c., PIPES, HYDRAULIC MAINS, FURNACE IRON WORK, AND SEAL VALVES (UNUSED). Yeadon Gas Company.

Company Meetings.

BRITISH GASLIGHT COMPANY. London Office, March 28. Twelve o'clock.

Stocks and Shares.

BARKING GAS COMPANY. April 3.
NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY. April 2.

TENDERS FOR

Coal and Cannel.

BRECHIN GAS COMPANY. Tenders by March 23.
COMMERCIAL GAS COMPANY. Tenders by March 28.
NEWPORT (FIFE) GAS DEPARTMENT. Tenders by April 2.

Coke.

WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by March 26.

Gasholder and Steel Tank.

ST. NEOTS GAS AND COKE COMPANY. Tenders by April 10.

Mantles and Jena Chimneys.

DUBLIN CORPORATION. Tenders by March 22.

Tar and Liquor.

HAWORTH GAS DEPARTMENT. Tenders by March 22.
TEIGNMOUTH GAS DEPARTMENT. Tenders by March 24.

Waggons.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS. Tenders by March 26.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
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O'NEILL'S OXIDE
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WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism London."

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Illustrated Advertisement will appear on March 27.
TEMPERLEY TRANSPORTER COMPANY,
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BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

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London Show-Room: 4, HOLBORN CIRCUS, E.C.

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MANCHESTER, S.W.
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SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

TAR AND LIQUOR WANTED.
Best Prices paid.
DENT AND CO.,
Ouse Chemical Works, SELBY.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 8, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

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(NATURAL.)
BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
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(with which is amalgamated WM. PEARCE & SONS, LTD.,
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TO WATER AND GAS COMPANIES REQUIRING CAPITAL.
THE Water and Gas Debenture Share Investment Trust, Limited, of 37, High Street, Tunbridge Wells, are prepared to Invest £10,000 Capital in above, and also to Underwrite Progressive Water and Gas Companies' issues.

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Supplied by C. BOURNE, 120, Manor House Road, NEWCASTLE-ON-TYNE.

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Address No. 4573, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, as Head Clerk and to Take ENTIRE CHARGE of Office Work, a Man of Intelligence and Experience, Active and Energetic. Salary, £100 per Annum.
Apply, by letter, stating Age and Details of Experience and work done, to G. HELPS, Gas-Works, NUNEATON.

WANTED, an Assistant-Manager for a Gas-Works in the South-West of England. Must be able to take Full Charge, and be a good Carbonizer and Draughtsman. Salary offered, £120 per Annum.
Apply, by letter, stating Age, Experience, &c., to No. 4575, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a capable Man to detect and remedy Leakage in Colliery district. Preference given to one having filled similar position. Would be required to fill in spare time Meter Taking, Service Laying, &c., to instructions of Foreman.
State Age and Wages required, enclosing *copies* of Two recent Testimonials, to No. 4570, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Smart, Energetic Candidates may apply by letter to the MANAGER, stating Age, and enclosing Testimonials or References. Total Abstainer preferred.

ROTHWELL URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

WORKING Manager required. Must be a good Fitter. None but steady and reliable men need apply.
Particulars of Duties and Salary to be given may be obtained from the undersigned, to whom written application (with *copies* of not more than Three Testimonials) must be made not later than Monday, the 2nd day of April next.
WM. TOZER,
Clerk to the Council.
Council Offices, Rothwell,
North Hants, March 15, 1906.

WANTED, Gas Meters, Obsolete, Wets or Drys, for Cash.
ROSSE WORKS, Leeds Road, BRADFORD.

ONE Bisschop Gas Engine and Pump combined on one bed, 6½-inch cylinder pump, 3¾-inch ram, £10. Liquor or Tar Tanks, 24 ft. by 7 ft., 35 ft. by 5 ft., 40 ft. by 5 ft., Rectangular Tank, 10 ft. by 4 ft. by 4 ft.
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Four Sets of DIRECT FURNACE IRONWORK.
Four SEAL VALVES.
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Applications and permission to view to be made to Mr. EDWARD LISTER, Manager.

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J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—Two Small Gasholders, one 20 feet diameter by 12 feet deep, with 4 Cast-Iron Columns, Lattice Frame Work, Pulleys, Chains, and Weights complete. The other is 12 feet diameter by 12 feet deep, with 3 Channel Columns, and T-Iron Frame Work, Pulleys, Chains, and Weights complete; also Steel Tank for above holder.
Offers to be sent to J. B. SCOTT, Manager, Cowdenbeath Gas Company, Limited, from whom further Particulars may be had.
The Purchaser must bear the expense of Taking Down and Removing.

FOR SALE, cheap, the undermentioned—
Four PURIFIERS, 10 ft. by 10 ft. by 4 ft. 6 in. deep, complete.
Two ditto, 10 ft. by 10 ft. by 4 ft. 6 in. deep, complete.
Two ditto, 10 ft. by 5 ft. by 4 ft. deep, complete.
One Cast-Iron SCRUBBER, 12 ft. high by 6 ft. dia.
One ditto 4-inch VERTICAL CONDENSER.
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Inquiries Invited for any other Gas Plant.
Apply to SAML. WHILE & SON, 60, Queen Victoria Street, LONDON, E.C.

TEIGNMOUTH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for their surplus TAR for Twelve Months ending March 31, 1907.
Tenders, endorsed "Tar," to be delivered to the undersigned on or before Saturday, March 24, 1906.
By order,
J. ALEX. GRAY,
Gas Manager.
Gas-Works, Teignmouth,
March 6, 1906.

COKE.

THE Directors of the Wandsworth and Putney Gas Company invite TENDERS for the removal of about 5000 Tons of Guaranteed "Wandsworth" COKE from these Works between April 1 and Sept. 30 next; the Coke to be removed by Van or Barge (free Waterway on the River Thames).
Sealed Tenders, endorsed "Tender for Coke," to be delivered here not later than the 26th inst.
The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.
Any further Information may be obtained from the Engineer, Mr. H. O. CARR.
CHARLES W. BRAINE,
Secretary.
Wandsworth and Putney Gas Company,
North Street, Wandsworth, S.W.,
March 12, 1906.

TENDERS FOR INCANDESCENT MANTLES AND JENA CHIMNEYS.

THE Corporation of Dublin are prepared to receive TENDERS for the supply of MANTLES and 6-inch JENA CHIMNEYS for Street Lighting, for the ensuing Year to the 31st of March, 1907.
Samples of at least Six each to be forwarded to the Town Clerk, City Hall, Dublin.
The Tenders to be enclosed in a sealed envelope, marked "Tender for Incandescent Goods," and addressed to the Chairman, Supplies Committee, City Hall, Dublin, and forwarded on or before the 22nd inst.
By order,
HENRY CAMPBELL,
Town Clerk.
Town Clerk's Office,
City Hall, Dublin,
March 12, 1906.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

TENDERS FOR WAGGONS.

THE Commissioners are prepared to receive TENDERS for the supply of Fifty 12-Ton COAL WAGGONS, constructed to the Board of Trade standard dimensions, and in accordance with the North British and Caledonian Railway Companies' standard specifications, with either steel or timber underframe, and one end and two side doors.
Further Particulars may be obtained on application to Mr. W. R. Herring, Chief Engineer and Manager, New Street Works, Edinburgh.
The Commissioners reserve to themselves the right to divide the order into multiples of not less than 10.
Tenders, endorsed "Coal Waggons," accompanied by detailed dimensioned Specification and Scale Drawing, are to be addressed to the undersigned, and delivered at 25, Waterloo Place, at or before Ten a.m. on the 26th day of March, 1906.
The Commissioners do not bind themselves to accept the lowest or any Offer.
JAMES M'G. JACK,
Clerk.
25, Waterloo Place,
Edinburgh, March 13, 1906.

THE Haworth Urban District Council are prepared to receive TENDERS for the purchase of their surplus TAR and LIQUOR during the year ending March 31, 1907.
Tenders to be sent to me not later than March 22.
WILLIAM ROBERTSHAW,
Clerk.
Burlington Chambers,
North Street, Keighley.

TENDERS FOR COAL.

THE Town Council of Newport, Fife, (Gas Department), invite TENDERS for the supply of CANNEL, Single, Double, and Treble Nuts, and Caking Dross, per Ton, delivered at their Railway Siding, for Twelve Months.
Tenders to be addressed to John Scrimgeour, Esq., Town Clerk, not later than Monday, the 2nd of April.
The Council do not bind themselves to accept the lowest or any Tender.
JOHN F. BLACK,
Manager.
Gas-Works, Newport,
March 16, 1906.

TENDER FOR COALS.

THE Brechin Gas Company, Limited, invite TENDERS for the supply of GAS COALS over the ensuing Year, from the 30th of June.
200 Tons of First-Class CANNEL or SHALE.
300 Tons of Second-Class " "
2500 Tons of SPLINT and NUTS.
Coals in close proximity to shipping Ports to be quoted f.o.b., others delivered free at Brechin Station.
Sealed Offers, marked "Tenders for Coals," to be sent, addressed to the undersigned, by Friday, the 23rd of March.
ALLAN REID,
Manager.
Gas-Works, Brechin,
March 12, 1906.

THE Directors of the St. Neots Gas and Coke Company invite TENDERS for a STEEL GASHOLDER TANK, also for a Spiral-guided GASHOLDER, 50 ft. by 16 ft., to be erected on their Works at St. Neots, in place of Two existing Holders.
Particulars and all Information will be given on application to the Manager.
Sealed Tenders, marked "Tank and Holder," to be addressed to the Chairman of the Gas Company, Eynesbury House, St. Neots, and must reach him on or before the 10th of April, 1906.
The Company do not bind themselves to accept the lowest or any Tender.
C. R. WADE GERY,
Secretary.
Offices, New Street,
St. Neots, March 17, 1906.

COMMERCIAL GAS COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of 180,000 Tons of Clean, Dry, Unscreened, Fresh-Wrought GAS COALS delivered f.o.b. to the Company's Steamers at any suitable port during the Year ending the 30th of April, 1907.
The deliveries to be in about equal monthly quantities throughout the year.
Payment in cash monthly.
Parties desiring to Tender for more than One Year must state separately the price and quantity offered for each year.
Particulars and Forms of Contract may be obtained from the Engineer, Mr. S. H. Jones.
The Directors do not bind themselves to accept the lowest or any Tender.
Tenders, sealed and endorsed "Tender for Coals," to be addressed to the Chairman of the Coal Committee, and delivered at the Company's Offices not later than Nine o'clock on the 28th inst.
Commercial Gas-Works,
Stepney, E., March 16, 1906.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 28th inst., at Twelve o'clock precisely, to transact the usual Business, and to declare a Dividend for the Half Year ended the 31st of December last.
Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 17th and RE-OPENED on the 29th inst.
By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.
Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 8, 1906.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARKING GAS COMPANY.

NEW ISSUE OF 600 £10 SIX PER CENT. PREFERENCE SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 3, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF £40,000 FOUR PER CENT. PREFERENCE STOCK.

THE Directors Offer for Sale by Tender £40,000 FOUR PER CENT. PREFERENCE STOCK, to be issued under the provisions of the Newcastle-upon-Tyne and Gateshead Gas Act, 1901. Applications receivable up to Ten a.m. on the 2nd of April, 1906.

Any amount of stock being not less than £5, or a multiple thereof, may be applied for.

A deposit of 5 per cent. on the nominal amount of Stock applied for must accompany each Tender, and the balance be paid on or before the 30th of June, 1906.

Interest at the rate of 4 per cent. per Annum will be allowed from the 2nd of April upon deposits and prepaid balances, dividend accruing from the 1st of July.

The Gas sold in 1905 was 2,887,804,000 cubic feet, and during the last Ten Years the sales have increased 49¼ per cent.

The Company has always paid its full statutory dividends.

MINIMUM PRICE—PAR.

Prospectuses and Forms of Tender will be sent on application to the undersigned.

(Signed) THOS. WADDOM,
Secretary.

36, Grainger Street West,
Newcastle-upon-Tyne,
March 13, 1906.

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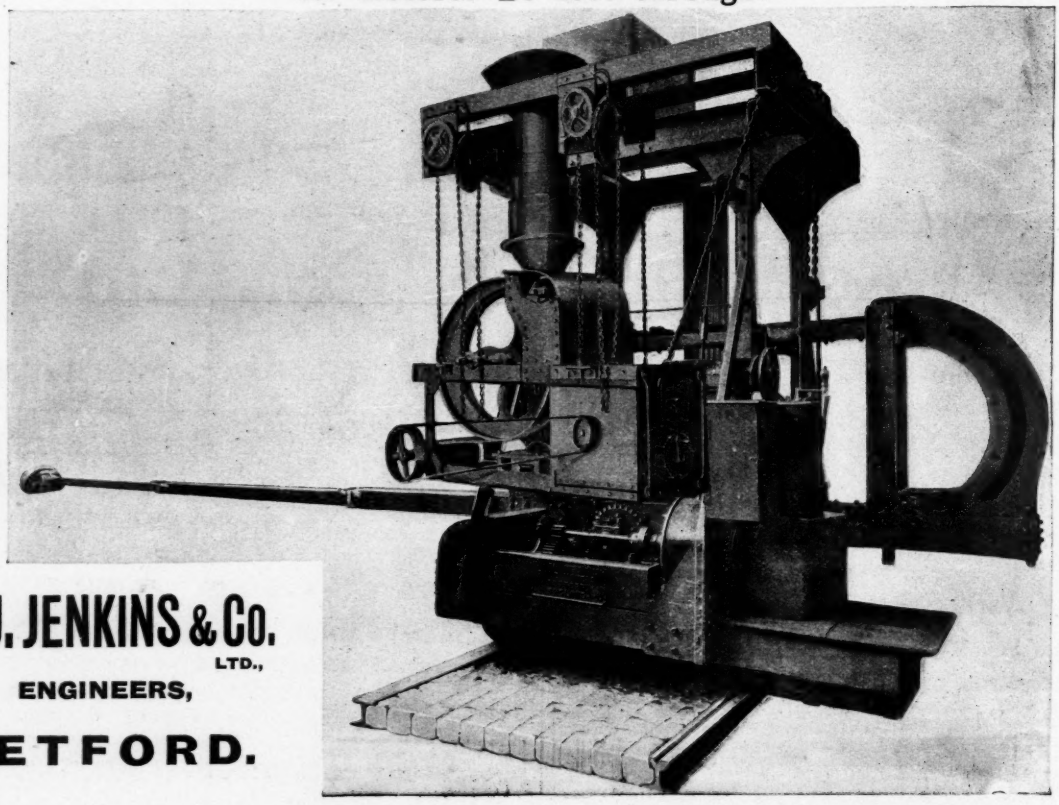
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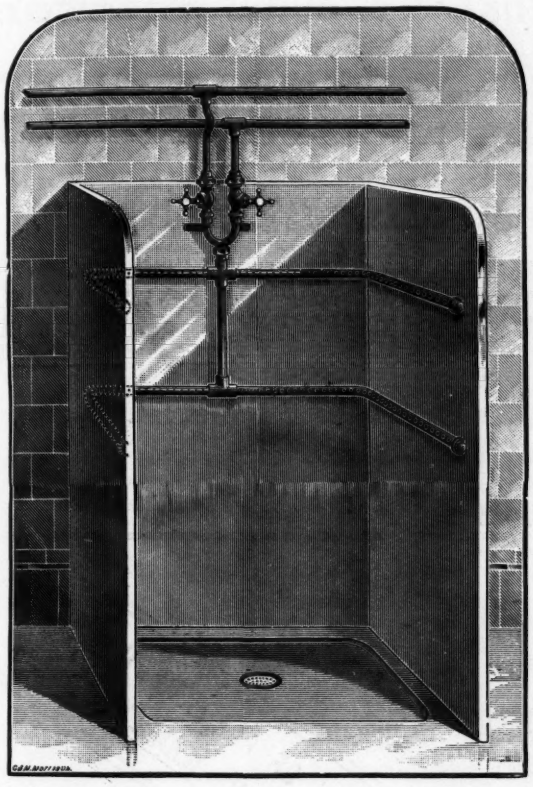

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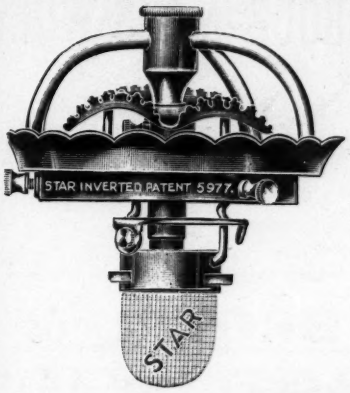

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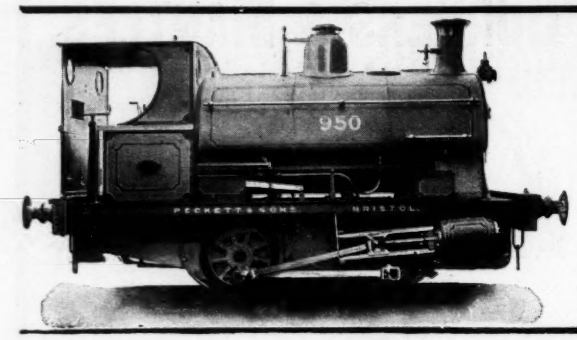

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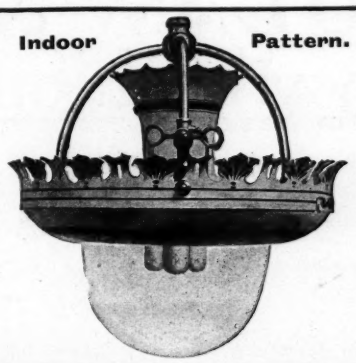

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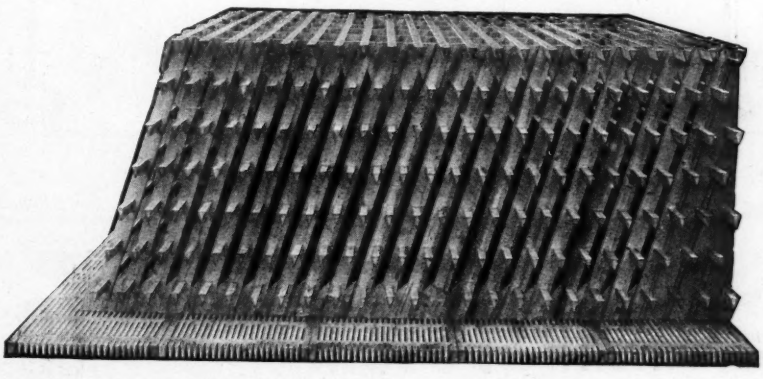

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References as to above can be had on Application.

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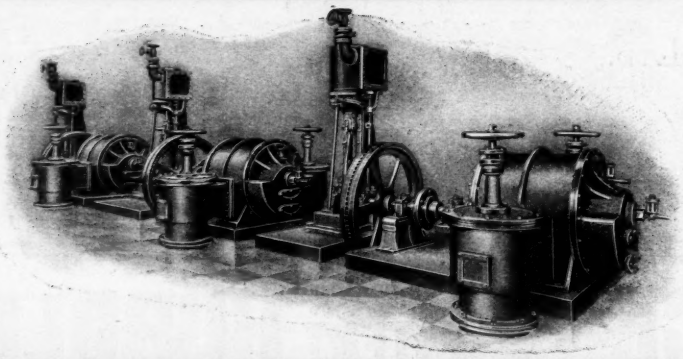

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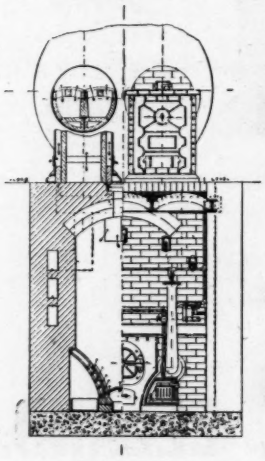

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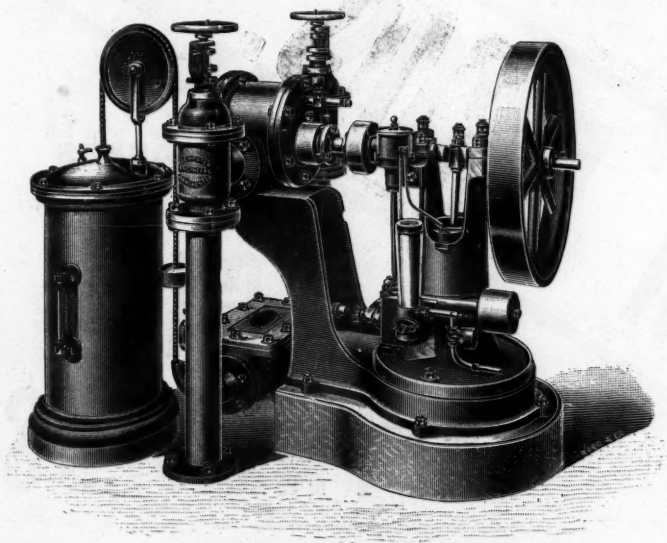

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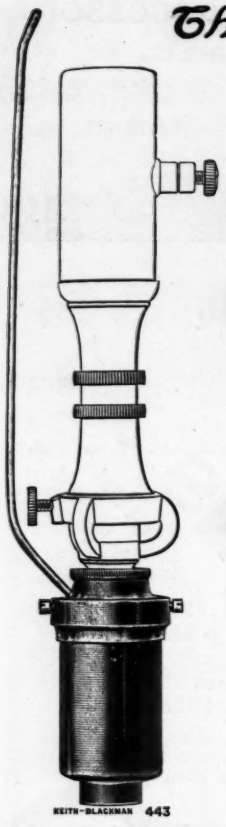

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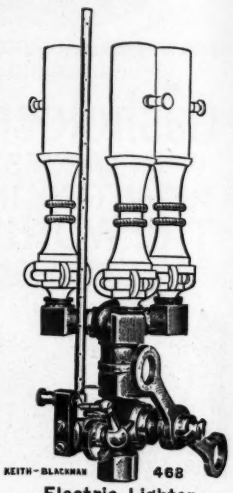

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